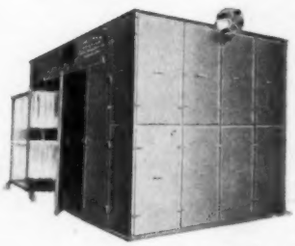
PERIODICAL DIVISION
1913

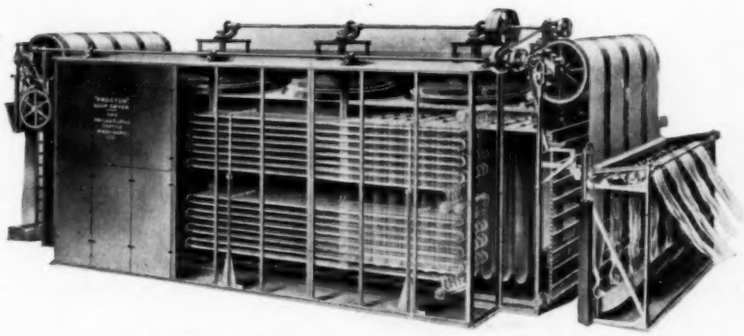
COTTON

SEPTEMBER, 1913

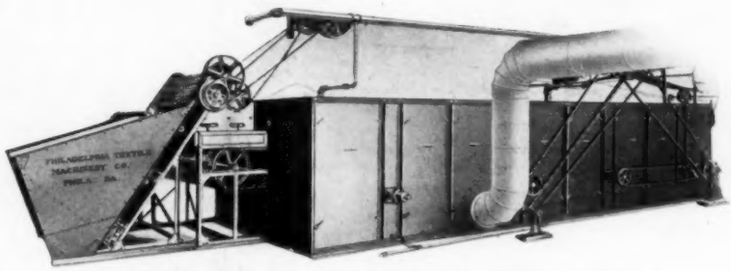
"PROCTOR" DRYING MACHINES



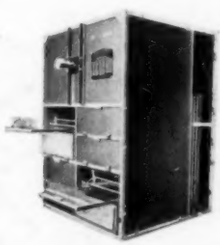
YARN DRYER.



DRYER FOR KNIT GOODS AND TOWELS.



DRYER FOR COTTON, WOOL, SILK, WARPS, ETC.



STOCKING DRYER.

The combination of simplicity, durability, and efficiency in the "Proctor" Dryers make their cost of operation and upkeep very low.

We build nothing but dryers and are therefore able to devote our attention entirely to the production of the best dryers that can be built.

THE PHILADELPHIA TEXTILE MACHINERY CO.
PHILADELPHIA PA.

INC. 1885.

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Carries Bobbins at Uniform Level

Produces more even twist

Filling bobbins carry ten per cent. more yarn

The only real improvement in spindles for years

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OUR RINGS

Set the Standard for Quality

THERE ARE NONE OTHERS "JUST AS GOOD."

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TRADE MARK REG. U.S. PAT. OFF.

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The Whitin Machine Works

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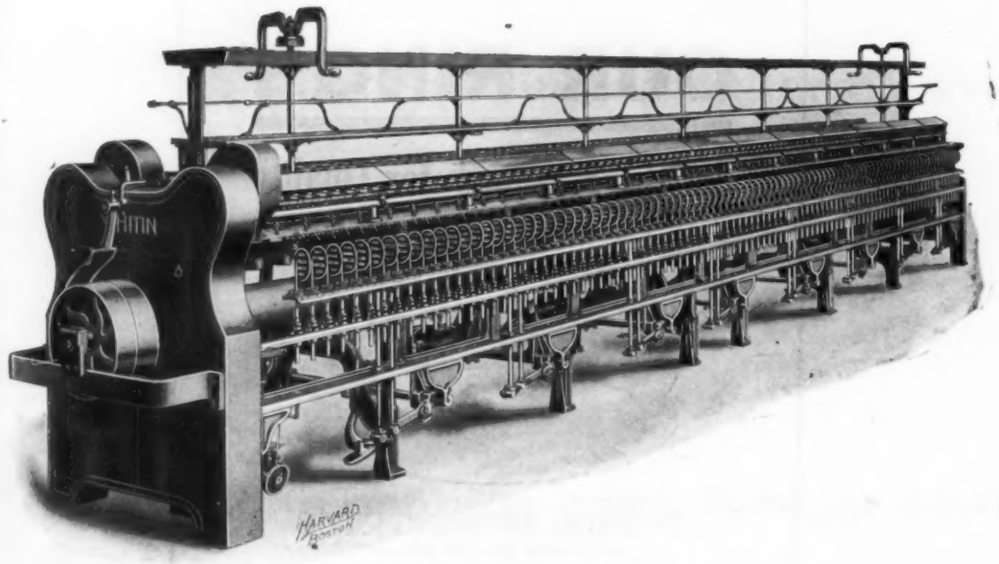
COTTON MILL MACHINERY



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Manufacturers of Carding, Spinning and Weaving Machinery for Cotton Mills.

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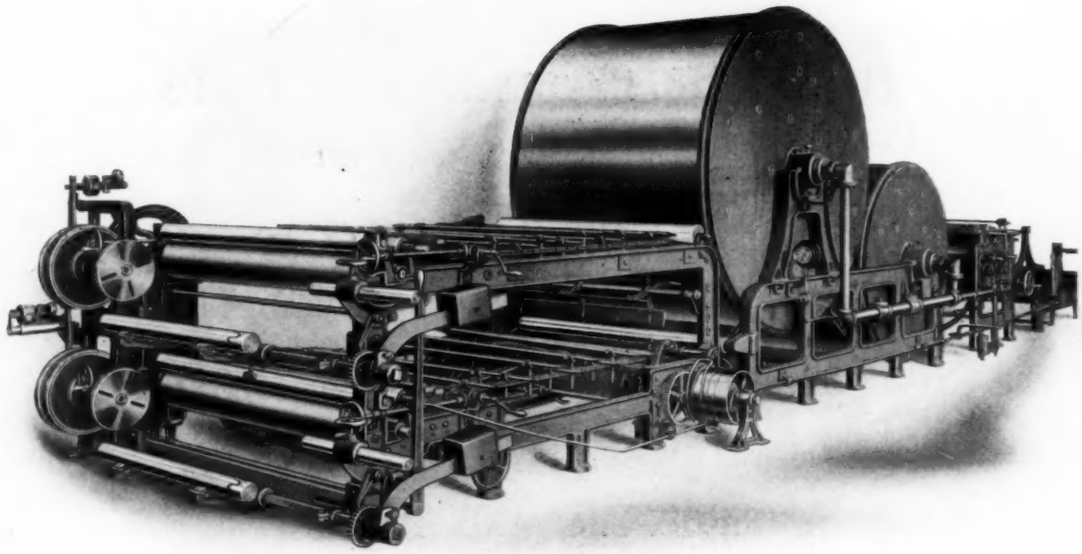
Complete Textile Equipments



CYLINDER SLASHER WITH DOUBLE HEAD FOR TWO LOOM BEAMS.

Complete Slasher Room Equipments

SLASHERS FOR ALL VARIETIES OF SLASHING

Two Cylinder Slashers
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Size Kettles
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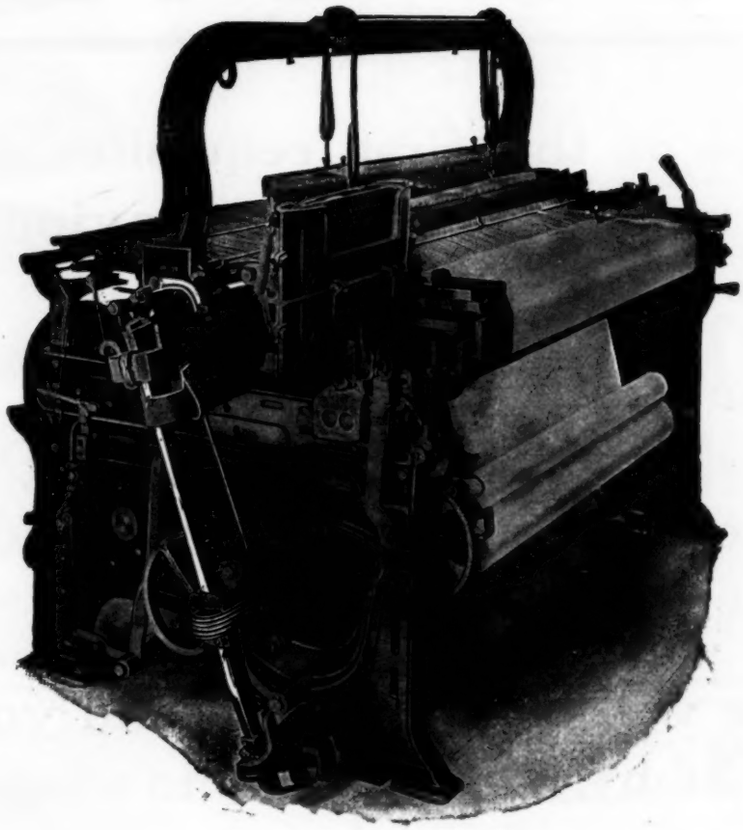
"IDEAL" AUTOMATIC LOOM



No other loom can equal it in production, quality of cloth, freedom from breakages and repairs and ability to us cope or bobbin filling.

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DOBBIES

One of the first requisites in the make up of a good loom weaving fancy fabrics is a good Dobby.

The Crompton & Knowles Loom Works build a complete line of Dobbies accepted everywhere as the standard of excellence.

We will be pleased to send you our new Dobby Catalogue, showing some of the types we make.

Looms for Every Known Fabric

Crompton & Knowles Loom Works

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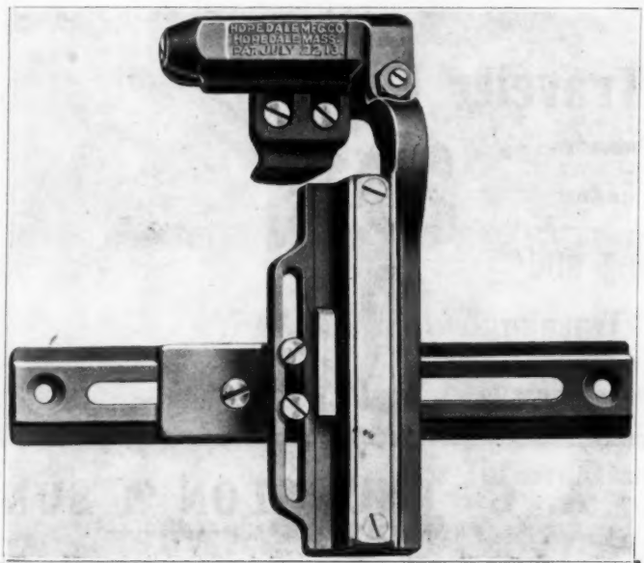
PROVIDENCE, R. I. PHILADELPHIA, PA.

WHITIN RINGS.

LIGHTEST RUNNING
MOST DURABLE, and
MOST ECONOMICAL.

Have you seen our
1910 Diamond Finish

WHITINSVILLE SPINNING RING CO. Whitinsville, Mass. U.S.A.



The only temple giving absolute rigidity of cloth holding pod. Adjustment provided for, insuring this important feature in long, continued service.

TEMPLE ROLLS made from seasoned dogwood, durable and tenacious, holding the specially pointed pins securely. Pins hardened and tempered uniformly, and have a shape and fineness of point that gives the best results with the cloth.

Also Complete Warp Stop Motions and Drop Wires.

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has been greatly improved and the output largely increased by the introduction of electric drive as applied in either the group or individual systems.

Allis-Chalmers Mule Motors are not only so designed as to secure the maximum output of the mule, but they also permit the natural speed variations of the machine so that the number of broken threads is greatly reduced and the quality of the product improved.

"Motors for All Drives"

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A Lace and Edging Machine That Runs Quietly at High Speed

Also adapted to manufacture of fancy knit goods, coats, sweaters, shawls, nubias, golf vests and their trimmings.

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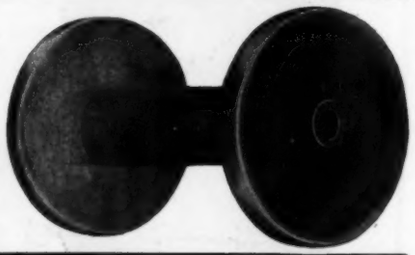
You say your loss from broken spools is but a mere trifle



Did you ever attempt to prove that statement? Do it, for your own satisfaction. The magnitude of this waste is not readily apparent in the stress of other matters, but if you will apply yourself to the matter you'll see it is a big item on the wrong side of your ledger. Our METAL PROTECTED SPOOLS will save practically all this loss for you. They rarely ever break or separate. When you consider that it's the full spool which breaks, you'll see why our METAL PROTECTED Spools save you big money. The metal does not rust or stain the yarn. It protects both the outside and inside of spool. We are making a special trial offer to mills who have never used our spool. Write for this offer and sample spools at once. ADDRESS ☞

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WOOLENS AND WORSTED

Patented Hosiery Winders, Cop Winders and Spoolers

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Fluted Rolls, Pressers for Flyers and General Machinery

Specialties made of Reeecking, Refluting, Filing and Honing of all kinds of Rolls

Speeder Flyers repaired and fitted with any style presser.

Spindles Straightened, Restepped and Retopped.

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The Greatest Improvement Made in Cotton Spinning in Twenty-Five Years

The Richards-Hinds Tube Roll

GUARANTEED CLAIMS

Cockley Yarn Preventor
Extra Strength of Yarn
Less Waste
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One-Third Saved on Leather Covered Rolls
Better Spinning

ON THE MARKET LESS THAN ONE YEAR, AND HAVE APPLIED SAME TO OVER 50,000 SPINDLES

For Information and Prices Write To

The Metallic Drawing Roll Company

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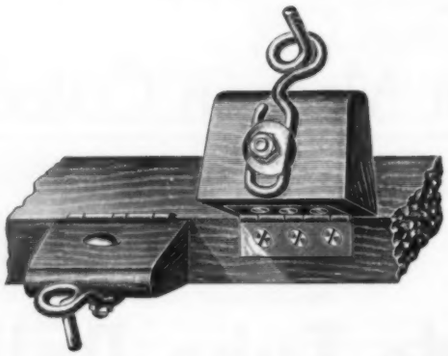
The Palmer Adjustable Thread Guide



For Ring Spinning and Twisting Frames

Easily adjusted.

Extreme accuracy and permanence of setting.

Cheapest of them all.

Mail guide-block for free sample.

Patented and manufactured by

THE I. E. PALMER COMPANY

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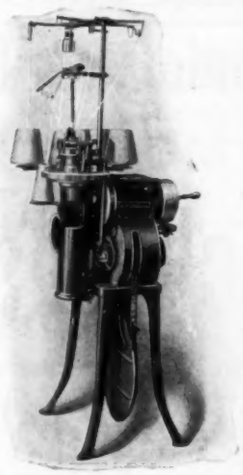
A New System of Machinery For Producing Seamless Hosiery

Scott & Williams Model B

INCORPORATED

Replacing Former Model B



Five Yarn Changes.

Sectional slackening prior to the heavy yarn changes, thereby preventing cutting and waste.

Fabric also slackened where high splicing yarn is inserted, thus insuring narrow ankle and foot.

Scott & Williams

INCORPORATED

Model F

The most comprehensive machine ever offered to the trade.

Makes women's hose with integral welt—no sewing necessary.

Or will make women's hose with selvage top, using any kind of yarn from silk to carded cotton.

Makes half-hose without a transfer.

All dropped from the machine—looping alone required.

Anti-run-back course preventing ravelling from garter tears and other causes.

This machine may also be used for making string work, or half hose transferred in the old fashioned way.

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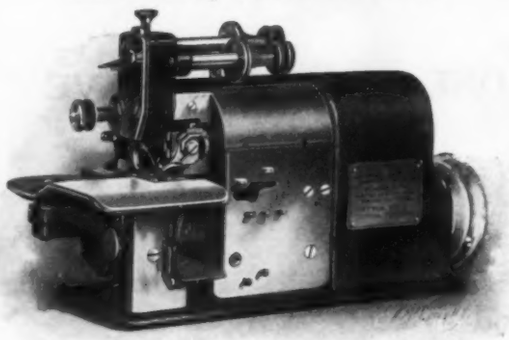
THE MERROW

High Speed Overseaming, Overedging and Scallop Stitch Machines



Our New Style 60 Machine

For Trimming and Overseaming in one operation produces the strongest seam with the greatest economy.

USE STYLE 60S for welting Stockings, blind stitch.
USE STYLE 60H for hemming bottoms of Underwear.
USE STYLE 17 or 22 for Bed Blankets.
STYLE 18 is for Horse Blankets.

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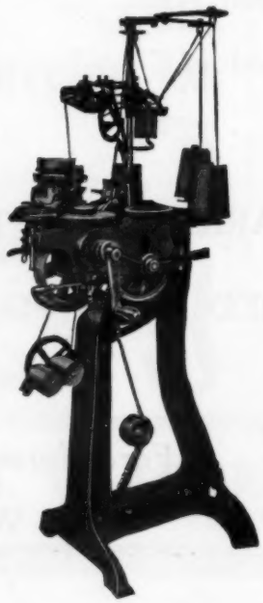

Quality

AND

Economy

INVINCIBLE

JENCKES KNITTING MACHINE COMPANY

PAWTUCKET, RHODE ISLAND

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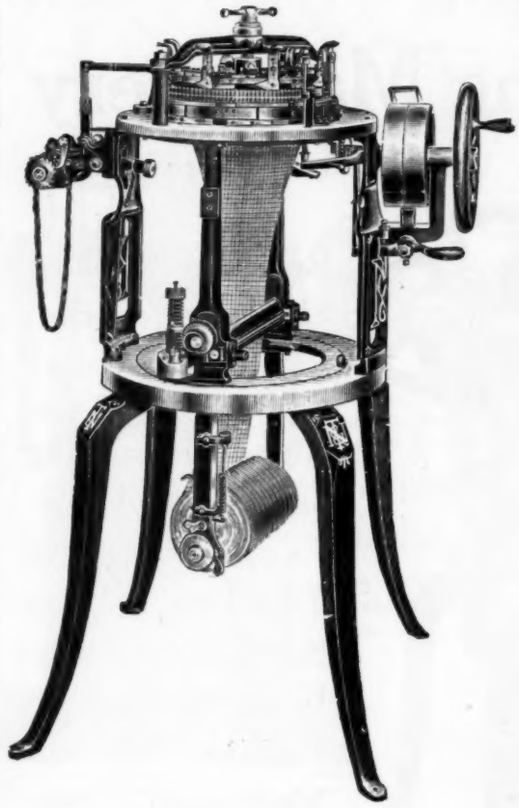

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Circular Rib

Knitting Machinery

FOR

Underwear and Hosiery

Office and Show Rooms
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Acme Hosiery and Textile Binder No. 30

A simple, inexpensive machine for Attaching Tickets on Hosiery Underwear, etc.

Uses a pointed staple. Cannot injure the finest Silk Hose. Is portable. Can be set aside when not in use. Is operated by foot power and has a patented WORK-HOLDING DEVICE, carrying one dozen or more pairs of Hose, keeping them in perfect alignment and presenting the tops in position to receive the tickets at least twenty-five per cent quicker than by any other method now in use.

For particulars and the address of the nearest agency apply to the manufacturers,

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Underwear, Sweaters, Cuffs with Cut Welt, Selvage, or French Welt, Mantles, Collarettes, Toques, Golf Caps, Hosiery Tops, Skirts, Borders, Corset Covers, Button Stays, Mittens, Bandages.

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Rectangular Slots, Hardened at Bottom, Sectional Caps and Cam Rings, Hardening and Ground surfaces, Sensitive Take-Ups, Two Speed Drive, Dogless Attachment, Positive Pattern Mechanism, Needle Guard and Protector, Automatic Stop Motions, Electric Cloth Cutters.

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Established 1889 **NORRISTOWN, PENN.**

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Rib Knitting Machinery

For Knitting the Latest Style Fabrics.
FOR

Underwear, Sweaters
Toques, Cardigan
Jackets, Borders, Etc.
Also Builders of

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The Stafford and Holt Pineapple Stitch Machine is the Latest

Write for Descriptive Circular

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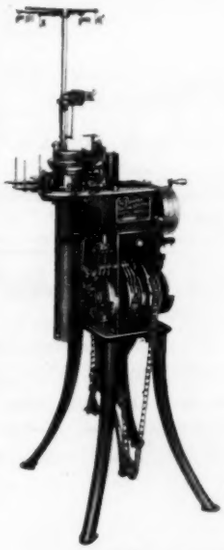
"THE BANNER"
HEMPHILL'S LATEST

FULL AUTOMATIC MACHINE

The FIRST Practical Revolving Cylinder Machine on the Market.



Built for either plain or split foot work, single or double feed. Adapted to manufacture hose with linen or mercerized heel or toe.

Also for Plaited Goods,
Silk and String Work
High Splice and Double Sole
Some of the latest improvements include:
Accordion Stitch Tuck Stitch
All-round Drop-stitch
These Improvements are fully
AUTOMATIC

Largest Production
More Yarn Changes
Highest Speed
Simplest
Least Repairs

Produces a Superior Quality of Work

Average Production 100 Machines a Week. Over 2,500 Machines Sold and Delivered from Jan. 1st to July 1st, this year.

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Quality of Product Secures for Our Customers

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Acme Knitting Machine & Needle Co.

Franklin, N. H.

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Wherever there is liability of injury to an employe, common humanity requires that first-aid-to-injured material be available. Johnson's First Aid Cabinet not only provides this humane necessity but has proven an economical equipment to thousands of employers and industries.

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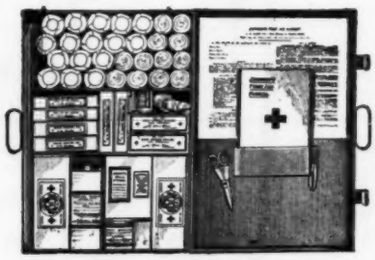

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Sold by the drug trade and mill supply concerns. Illustrated and descriptive literature on request.

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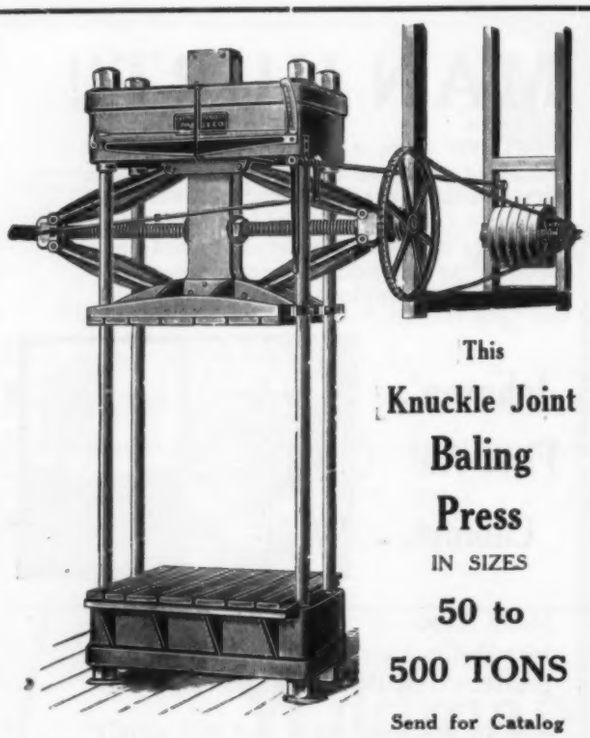
COMPLETE MILL EQUIPMENT
Patent Barchaul Machinery for Making Yarn from Cotton Waste, Etc.



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Knuckle Joint Baling Press
IN SIZES
50 to 500 TONS
Send for Catalog

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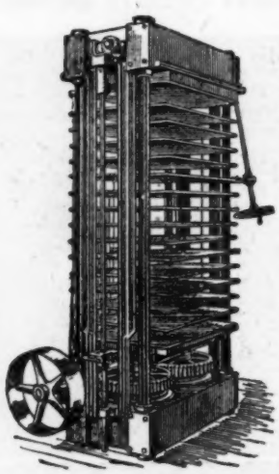
A. H. WASHBURN, Charlotte, N. C., Southern Agent



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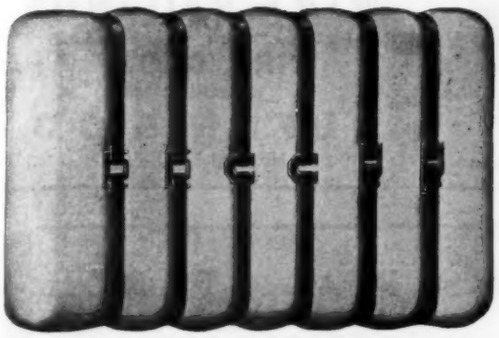
Hot Plate Screw Press
FOR
Hosiery and Underwear
Write for Catalog and Prices
CHARLES HART,
Reliance Machine Works,
FRANKFORD, PHILA.



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Acme Steel Goods Co.

Main Office and Works
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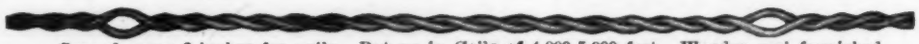
Corner Irons
Case Seals
Acme Galvanized
Twisted Wire

ACME
ESTABLISHED 1880



Spread every 6 inches for nails. Put up in Coils of 4,000-5,000 feet. Wooden reel furnished.

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FOR COTTON, WORSTED, SILK AND SCHAPPE YARNS AND WIDEGOODS

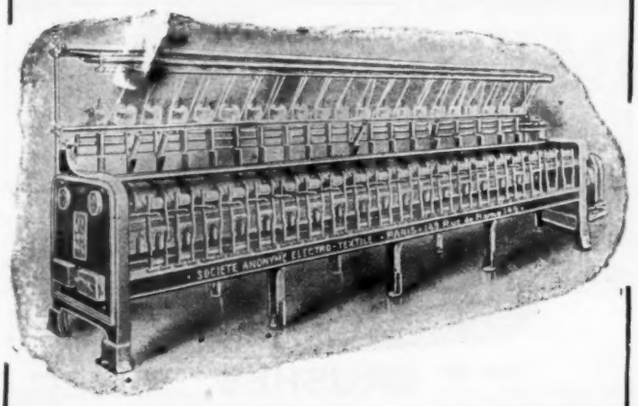
Economy, Quality, Hygiene

We lower your cost of production from 30 to 60 per cent.
We produce yarns of finer quality.
We produce yarns of better color.
We give you absolutely clean yarns and CLEAN SAFE WORK-ROOMS.
Simple to operate.

The only machine that allows manufacturers to meet the demands of increasingly rigid legislation controlling the health conditions of the work-room.

SOCIETE ANONYME ELECTRO-TEXTILE
SOLE AMERICAN REPRESENTATIVE

THEO. F. HUSSA, 136 Liberty St., **New York**



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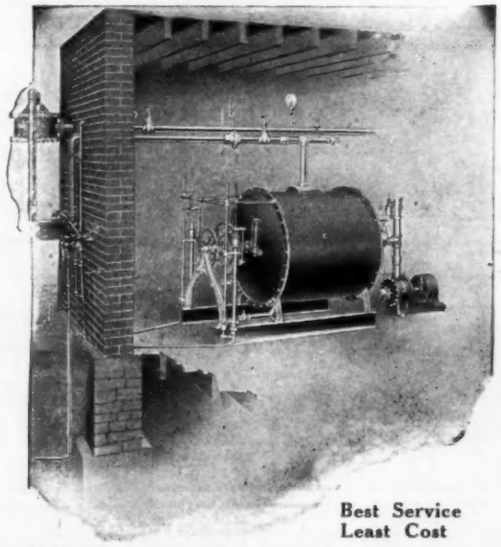

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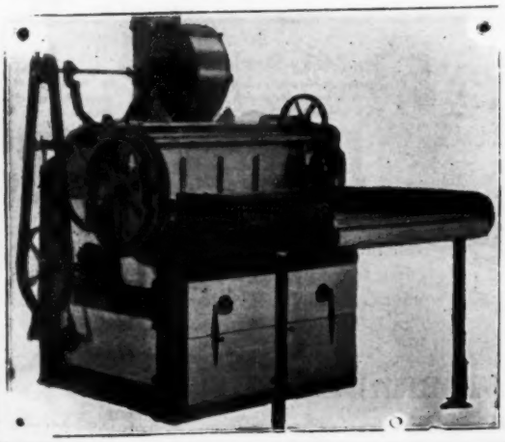

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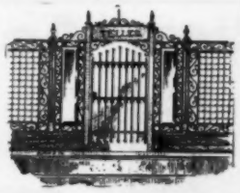

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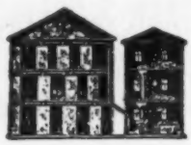

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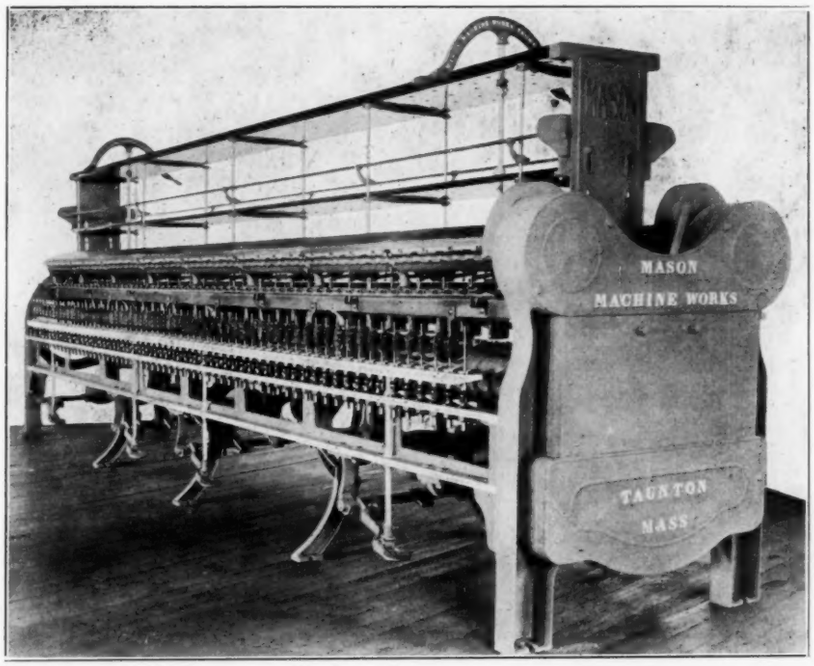

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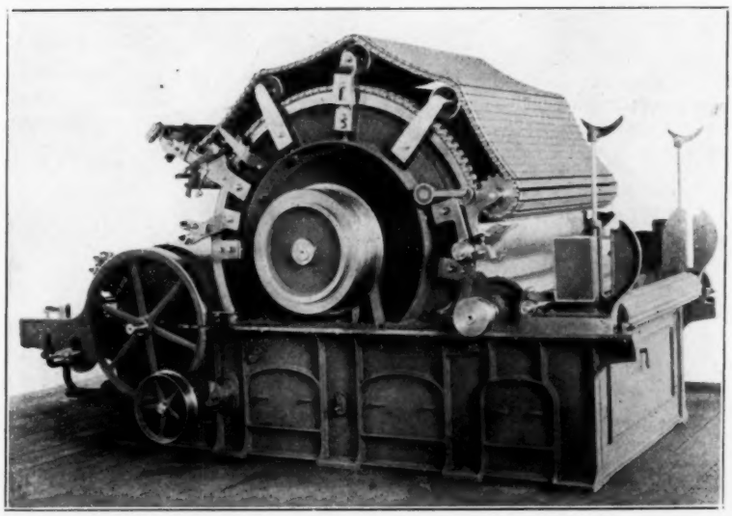

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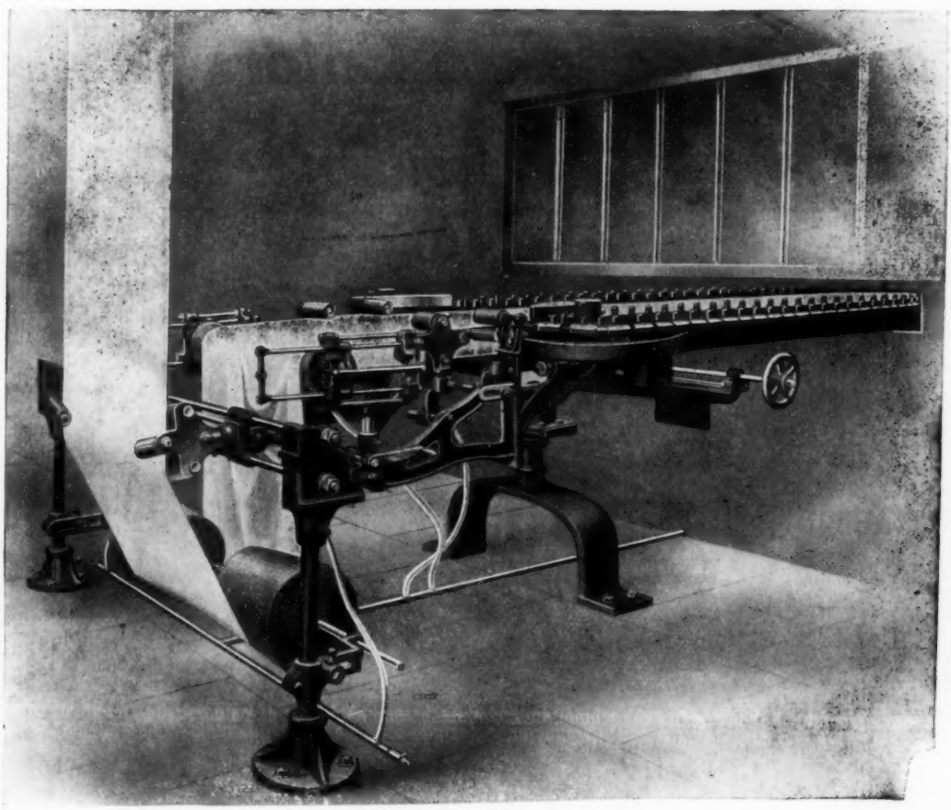

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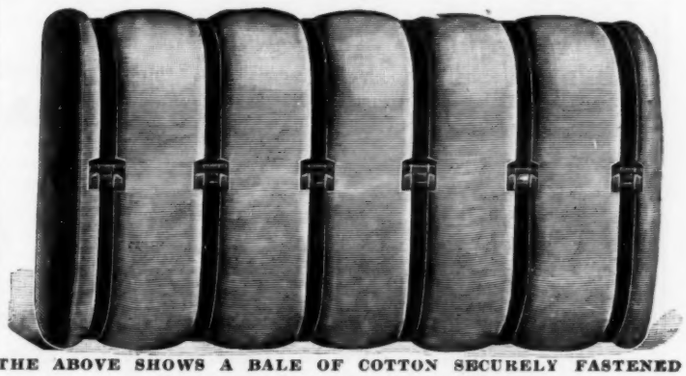

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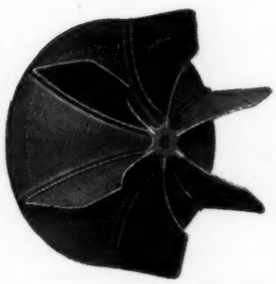

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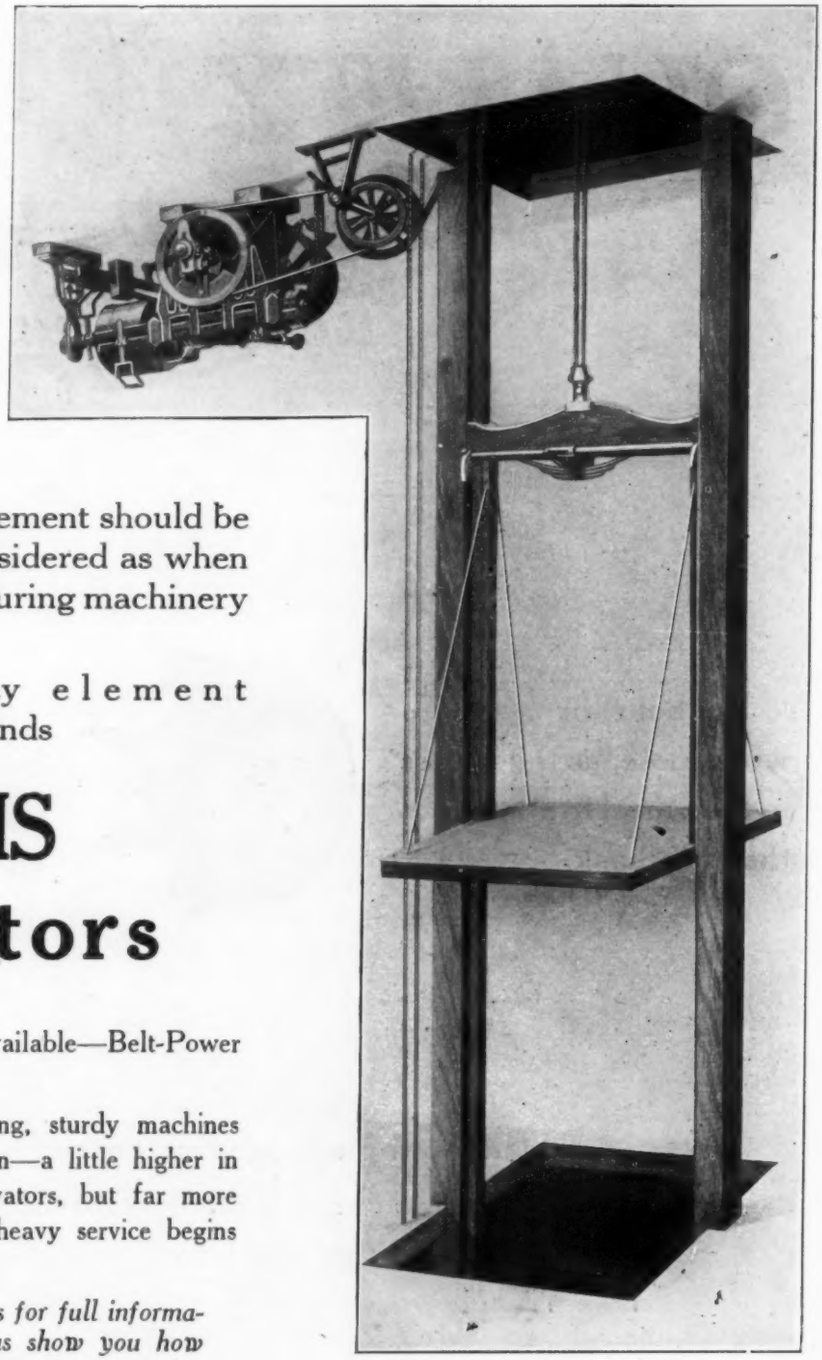

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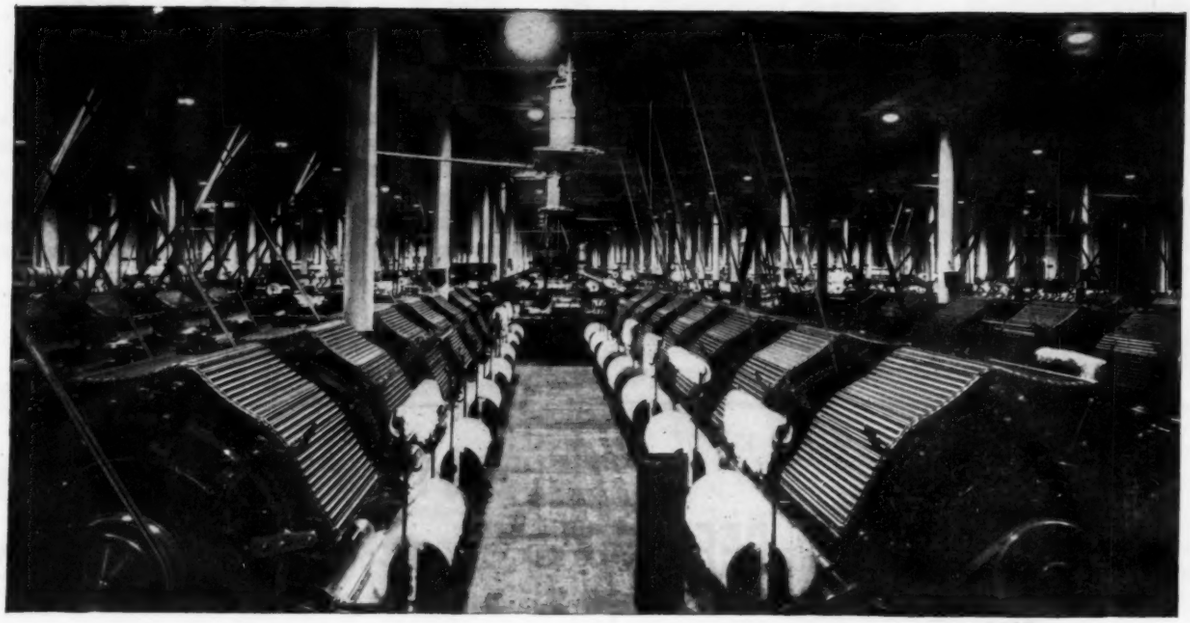

Photograph of Carding Room in a Southern Cotton Mill. 75-60 watt clear Edison Mazda Lamps are used, equipped with aluminum finish intensive distribution Holophane—D'Olier steel reflectors (A1-60).

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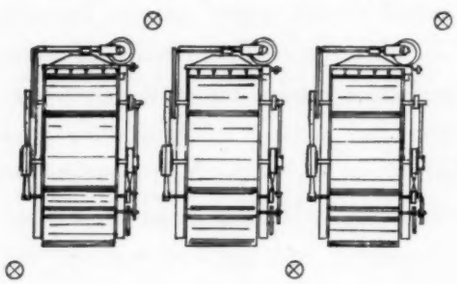
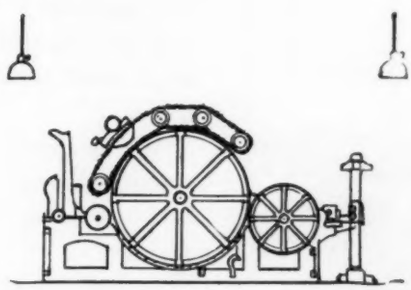
Fig. 2 shows in elevation the approximate location of extensive reflectors.





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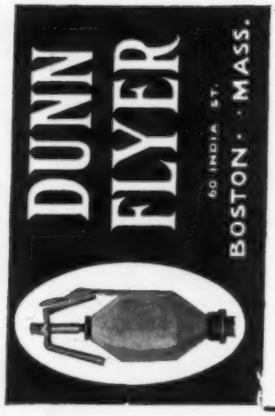

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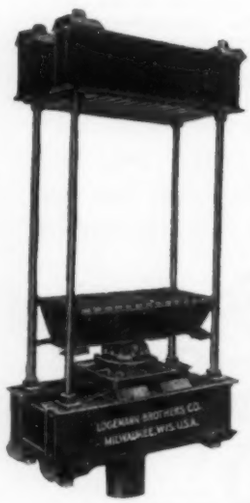

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PUBLISHED MONTHLY

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SHOULD TEXTILE SCHOOLS HAVE A HUMAN NATURE DEPARTMENT?

When a man is to deliver a speech on a subject that sounds somewhat intimidating, he usually begins by telling a story. The story serves the double purpose of interesting his hearers and illustrating the points to be discussed later in his address. On this occasion, we are going to emulate the speaker and tell a story. It is, however, the recital of an actual experience.

In a certain large mill the girls in the drawing-in department had been complaining to the overseer for some time. Not of anything in particular, but on general principles. The overseer had consulted with the superintendent, but as there was nothing definite to work upon, nothing had been done. On one hot summer morning, the girls suddenly quit their work and marched to the office of the superintendent. They filled his office and overflowed into the hall. The spokeswoman of the occasion, whom we will call Jennie, began a general tirade against conditions, wages, hours of the labor, and nearly everything else, and the superintendent silently listened and wondered what he should do. Suddenly he heard a girl out in the hall say, "Oh, come out of here! Let's go up the street and get a soda, I'm hot!" Being a wise and experienced old man, this gave him his cue. Reaching in his pocket he produced a two-dollar bill, which he handed to Jennie, saying, "Now, Jennie, you're hot; I'm hot; everybody is hot. You take this up to the drug store and get the girls some ice cream soda, and when you all get cooled off, you come back here and we'll talk it over." That incident happened several years ago, but the girls have never been back to "talk it over." Although they all went back to work at noon, the incident has never been mentioned by either party. That was one phase of human nature. That old man was a student in the school of experience.

Human nature, as it is commonly termed, includes all the original endowments or propensities that pertain to a man under natural rather than abnormal conditions. Many of these are characteristics acquired in early or later life and as all are controlled by the varying states of the human mind, a study of these resolves itself into a study of psychology, this being the science which classifies and analyzes such phenomena.

This may sound rather awesome to the novice, and even to the staid heads of textile schools, but after all the textile student is primarily preparing himself for an executive or directorial position. The qualifications for such a position, if real success is to be attained, is the ability to handle machinery and men. In fact, the student's ability to handle operatives should be more highly cultivated than his ability to handle machines.

Cotton mill machinery today may be depended upon to fulfill certain requirements under certain sets of conditions. Unfortunately, we can not place the same dependence upon

the operatives who handle the machinery. Every employee has either a liking or a distaste for his work. Positions are frequently occupied by operatives into which they have drifted indirectly and without other apparent reason than by chance. There are hundreds of such operatives who do not appreciate or admire the work they are following, and merely stick to the position because no way seems open by which they can secure equal or better remuneration in some other class of work better suited to their tastes.

There is another class who exhibit neither desire for advancement nor even interest in their present condition other than that absolutely necessary in order to hold the position occupied. Then there is a third class of ambitious workers, who seek every chance to make a step upward. Interspersed among these three classes are the great mass of operatives with mental characteristics of every degree and shade, of both sexes and of all ages.

This, then, is the great human machine that must be handled by the textile graduate. It will be small or large, as the individual capacity and aptitude of each graduate is indicated. At the present time these young men go into their lifework blindfolded, as it were, untaught and unfit to handle this machine until they have learned by experience many of the things they might have been and should have been taught in connection with their technical education.

That this study of psychology should first take up the study of each student's own personality is evident, as a man who is unable to control himself is never very successful in an executive position calling for the direction of others. The average student is usually lacking in diplomacy and a knowledge of human nature. This is why so many acquire with their first directorial position an enlarged conception of their own importance and often a dictatorial manner that soon becomes obnoxious to those associated with them or working under their direction.

When the larger section of the problem, the study of the operatives in relation to their work, is taken up, it will be found to divide itself into natural sections which will involve the selection of the best possible operatives and allotting to them the work best suited to their individual capabilities.

In many cases the individual knowledge of a technical or mechanical operation may be small and the operative must be trained. It is evident that some methods of teaching or training are much better than others; are more economically advantageous because the desired end is attained more quickly and more reliably. An excellent example of one method of training was given by William Shaw in his able article on "Training Operatives," which was published in the July issue of COTTON. But the process of learning is usually left to chance. The new operative is allowed to acquire such training, by observing other operatives and applying an individual conception of those observations. This culminates in a complex series of imitations that always result in economic waste.

Such a situation may be fairly compared to the story of the little boy who was to go to a church supper with his aunt. Before he left home his mother instructed him to do just what his aunt did at the table, and he would be a good boy. On his return he informed his mother that he had tried to follow her instructions, but that he could hardly cut his food at all when using the knife with his left hand. This is the position of those operatives who are expected to learn by observing those around them. All persons are not left-handed.

While training the operative represents the preliminary problem, the truly fundamental question of what can be done to eliminate everything that tends to diminish or decrease efficiency still remains. The reaction produced on the human machine by slight changes in light, heat and noise, as well as the effect of similar changes of even the fractional part of an inch in the height of the chairs of operatives who work while seated, effect definite results from a productive standpoint. In other words, the more careful adaptation of the mechanical machine and its surroundings to the psychological energies of the operative is essential where high quality and economical production is desired.

Motion study or the economy of movement, is generally left to the efficiency engineer, but young overseers and superintendents should be efficiency engineers in their special lines and this subject should also receive attention in the human nature department. In any case it is so closely interwoven with the previous subject as to be almost inseparable.

In a study of the psychophysical conditions, fatigue and restoration demand especial consideration. The continuous repetition arising from the performance of the same operations over and over again, would tend to produce monotony, yet this does not seem to be the case except in occasional isolated instances. The introduction of the piece work system militates against such a result, and often stimulates a workman to the point where he is in a continuous race with himself against time.

Another interrelated phase that is inherent with work of this character, where the continuous repetition of certain motions becomes a partial habit, is the effect of any sudden change in the surrounding conditions through which the attention of the operative is hindered and the product of his labor thereby decreased.

These are only a few of the multiplicity of details that should be thoroughly covered by such a department. The mental reactions produced by a wide variety of causes in the individual factors of this great human machine, constitute a life study for any man, but a human nature department could be made to lay the foundation and plan a superstructure for such a study that would be of enormous benefit to the graduate in later life.

SOUTHERN COMMERCIAL CONGRESS.

The Southern Commercial Congress will hold its fifth annual convention in Mobile, Ala., October 27 to 29. This great movement which represents a union of the Southern states for the purpose of bringing about a better understanding of the resources of the South itself, and by the Nation, held its first session in Washington in December, 1908. During each of the years paralleling the years of the war between the States, the programme worked out relates to some great feature of the South's recovery. In Atlanta in 1911 the South's Physical recovery was set forth. In 1912 at Nashville the South's Agricultural recovery. In 1913 at Mobile the South's recovery in Commerce will be typified and linked up with the completion of the Panama Canal.

Definite details of the programme have not yet been announced but a large proportion of President Wilson's cabinet are expected to be present.

ASPECT OF COLORS UNDER ARTIFICIAL LIGHTS

How the Optical Attributes of Dyestuffs Affect the Appearance of Dyed Fabrics. The Importance of a Working Knowledge of this Phenomena When Dyeing Dress Materials. How to Test Daylight Substitutes of Electricity or Gas.

(*Contributed Exclusively to* COTTON)
BY DAVID PATERSON, F. R. S. E., F. C. S.

In a previous article in COTTON were described the usual color changes which all colors undergo when examined under the ordinary artificial illuminants; especially those having an undue excess of orange and red rays like the oil lamp, gas and candle lights. Their effect on color appearance is to make all red and orange look much brighter and yellower. Yellows appear lighter and a faint yellow might easily be mistaken for a white in gas light. Bright greens and bluish greens look well and show little change; while azure blues, indigos and violets all appear duller and redder. A beautiful ultramarine blue will sometimes look like a blue-drab, or a slate, in artificial light; delicate tints of sky blue and heliotrope may appear almost pink; while deep navy blues and violets look like blacks.

All such modifications are perfectly normal and are due—as already explained in my former article—simply to the deficiency of the blue and violet rays in these artificial lights, and a corresponding excess of the red and orange rays. The general and normal effect is a subtraction of more or less blue and violet from the color's daylight apearance, with an addition of a little red and orange. If all our coloring matters were of the nature of artist's pigments, as used in painting, or of the natural dyestuffs as used to be employed in dyeing, then practically all the color changes observed in gas light would be of the ordinary or normal character.

But, since the introduction of the so-called coal tar or aniline dyes, with their sharp and decided optical properties, the color changes under artificial light have become *abnormal*, and often exceedingly perplexing. For example, it is possible to have two samples of a beautiful soft shade of dove-grey dyed upon wool or silk and matching each other so perfectly in daylight that anyone might take them for exactly the same color. But, if we examine them in gas or lamp light they will appear totally dissimilar. One may apear of a *sage green* color and the other more like a *reddish plum* color.

Likewise we may have before us two shades of olive or yellow-green and they may appear identical in every respect. Examine them under lamp or candle light and it would be difficult to believe that we were looking at the same colors. One looks much greener, while the other looks quite a russet, or red-brown, making their appearance totally different. Many such examples might be cited and are well known to the practical dver, but to the general public, or to an artist who works with pigments, the changes in hue are almost incredible.

The reader can readily understand what a difficult and perplexing question it becomes for the dyer to make a perfect color match in many cases.

IMPORTANCE IN DRESS MATERIAL.

If we consider a moment we will see the grave importance of this question to the dyers of dress materials. A dyer has sent to him, say, a piece of woolen material dyed a soft fawn color and he is instructed to dye silk to match the color of this dress material. He does so to the best of his ability and dyes the silk to match exactly the daylight aspect of the original stuff. All seems satisfactory until the woolen and silk materials are made up into a dress—let it be, say, a skirt and a blouse—and are viewed under any artificial light. The chances are that the silk material of the blouse will appear totally different in gas light from the skirt. They "don't go together" and naturally the fair wearer complains of the badly matched materials. The same difficulties are experienced with dyers of silk linings, facings and trimmings and constant complaints are being made as to the want of proper matching of the shades when viewed under gas light.

The same thing happens in the colors of rugs and carpets, though naturally they are not so noticeable as in dress material. Perhaps a fine Eastern rug is wished to be copied in every detail of coloring and the result may be highly satisfactory when examined in daylight, but it very often happens that when such copies are examined in gas light, side by side with the original Eastern product, the copies do not possess the same harmonious and uniform quality of coloring. One or two colors may look quite different in the gas light; coming up strong and harsh, and thus destroying that beautiful balance of color observed in the original.

I have seen repeated instances of this, and there comes to my recollection rather an amusing case of a leopard skin coloring of a rug, which was copied to perfection in regard to its daylight appearance. The soft, tawny brown coloring and black markings of the natural skin were faultlessly produced, and so natural did the rug appear that an observer standing a few yards away took it for a genuine leopard's skin. But, alas, when viewed in gas light, while the original showed no change in color, the brown color of the copy became an *olive-green*, quite a remarkable metamorphosis for such an animal.

Of course, with a little knowledge of the optical behavior of the dyestuffs, the dyer could easily have made a brown that would not have changed under gas light, by selecting different dyestuffs.

It is a very good plan and one which many ladies adopt, to select *under an artificial light* whatever material is meant to be worn in gas light, and this avoids disappointments.

THE CAUSES OF CHANGE.

One naturally asks: "What's the cause of such color changes?" They are due solely to the optical structure of the dyestuffs which have been used in the dyeing of the material. Let us study a few simple examples which will serve to illustrate all similar color changing phenomena. Every student of color science knows that it is possible to have two colors apparently identical to the naked eye,

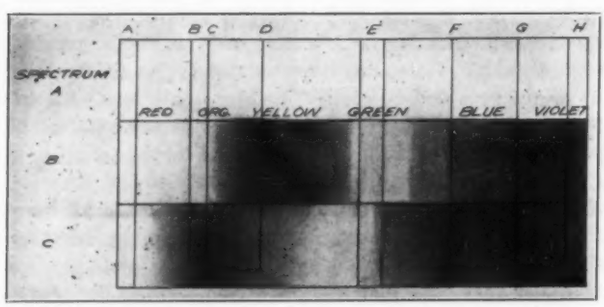
yet composed of different properties, and different parts of the color spectrum. Their optical structures are different and this difference can only be seen by examination with the spectroscope.

The following experiment is instructive in this respect. Two beautiful azure blues may be made in solution into a test tube. One may be made by adding to a dilute solution of Methyl Violet, a few drops of Malachite Green. This gives a fine azure blue in daylight. The other test tube may be filled with a dilute solution of Prussian blue, obtained by adding a few drops of yellow prussiate of potash to a dilute solution of iron nitrate.

These two blues when examined side by side may be said to be identical in appearance, but, if we examine them in gas or lamp light a great difference is observed. While the Prussian blue retains its beautiful color in gas light, the other aniline color composite blue changes to a purplish-red color and will even become *magenta* if the solution be strong enough. If they be examined through an orange or red film, the difference is further accentuated; the Prussian blue looking almost a black, while the other becomes a ruby red. The reason for this behavior is found in the absorption spectra of the colors. While the composite aniline blue freely transmits all the red rays and absorbs a certain portion of the green; the other blue does not so readily transmit the red, but freely transmits the green and blue.

SPECTROSCOPIC EXAMINATION.

Let us study carefully a simple case of two shades of a soft sage-green color. One is dyed with an aniline yellow shade, such as naphthol yellow and a little blue violet. The other, matching the former exactly in appearance, is dyed with napthol yellow, wool green and a little red. Under artificial light the first changes into a reddish brown color, or more like a plum red, while the other becomes much greener in color, thus making the widest divergence in their appearance under gas or lamp light. By examining their optical structure with the aid of the spectroscope and seeing what is termed their absorption spectra (*i.e.*, the various parts of the spectrum that are quenched, or absorbed), the cause of the color changes is revealed. For the sake of ready comparison the spectra are placed beside each other in our illustration.



A REPRESENTS THE SOLAR SPECTRUM WITH ITS COLORS, RED TO VIOLET.

B IS THE ABSORPTION SPECTRUM OF A SAGE-GREEN COLOR MADE WITH VIOLET AND YELLOW.

C ILLUSTRATES THE ABSORPTION SPECTRUM OF A SAGE-GREEN MATCHING B, BUT MADE WITH YELLOW, WOOL-GREEN AND RED.

Spectrum A is that of the sunlight showing the colors red, orange, yellow, green, blue and violet with the solar lines A, B, C, to H in the extreme violet.

To any of my readers who are unacquainted with spectroscopic work, it may be mentioned that these lines represent the wonderful black lines present in the solar spectrum which serve as valuable land marks in describing any particular part of the spectrum. Owing to their unchanging nature they are often termed the "fiducial lines."

Spectrum *B* is the sage-green made with yellow and violet. The shaded portions represent the dark or absorbed parts of the spectrum, where the light is quenched more or less, and the unshaded parts are where the light is freely transmitted, if it be in the nature of a solution, or reflected if the colored light comes from the *surface* of the dyed material. The spectrum of this shade is seen to consist principally of red and a portion of the green rays, while the yellow at D line, is strongly absorbed, and to a less degree the orange, as far as nearly the C line. The yellow-green is also quenched to nearly the two E lines in the green. Absorption again begins half way between lines E and F and continues all through that part of the spectrum of the blue and the violet.

Now, let us examine spectrum C, which represents the optical structure of the sage green composed of yellow, wool-green and a little red. It will be at once observed that nearly all the red rays are absorbed with the exception of a small band transmitted at the extreme red end of the spectrum at line A. The orange rays are totally quenched and absorption continues on to half way between lines D and E: *i.e.*, to the yellow-green, which is freely transmitted. Absorption again commences at the second E line and continues with increasing strength throughout all the blue and violet.

By comparing carefully these two absorption spectras (B and C) we will observe that B freely transmits all that part of the red, scarlet and orange which is absorbed in the C spectrum. This at once shows to us why the first color should become so *red* under artificial light. *It freely transmits all these red and orange rays that are so plentiful in gas and lamp lights.* Spectrum C quenches them, but freely transmits the *bright yellow-green* instead, which is more or less absorbed by the other. Thus, under a light like gas, candle, or oil lamp, the one will naturally tend to become much redded and the other (spectrum C) will tend to become greener in apearance. Here, then, we have traced to its very source the cause of this perplexing phenomenon and find that it arises solely from the difference in optical structure of the two apparently similar colors.

An important fact to remember is this: That in all such compound colors, it is generally *one* color constituent that causes such abnormal changes in gas light. If a dyestuff has a strong and decided behavior under artificial light, that behavior will be observed in all the compound shades with which it enters as a constituent.

The table illustrates this clearly and the disturbing factor, or modifying cause is pointed out.

Many more examples might be given, but the above are sufficient to show the method of examination it is best to adopt when studying such phenomena.

ARTIFICIAL LIGHT.

In the arts and industries it is very desirable to have a really good artificial light, able to show up the correct daylight aspect of all kinds of colors. To artists, and especially to dyers, it is an absolute necessity. During the dark weather of winter it is necessary for the dyer and color matcher to have a reliable artificial light to aid him

TABLE.

COLOR BY DAYLIGHT. (Each Pair Matching).	CONSTITUENTS.	GAS LIGHT ASPECT.	MODIFYING CAUSE.
Sage-Brown.	Wood-green, orange and red.	A green sage.	Wool-green which deepens in gas light.
Sage-Brown.	Archil, fustic and indigo Extract.	A purple.	All three redder in gas light.
Azure Blue.	Fast acid blue.	Little change.	This blue keeps its shade well in gas light.
Azure Blue.	Methyl violet and diamond green.	Much redder, like a violet.	Methyl violet reddens much.
Soft Grey.	Aniline grey and fustic.	Trifle redder.	Fustic reddens.
Soft Grey.	Orange, fast acid violet and methylene blue.	Much greener.	Methylene blue deepens.

in matching his shades, otherwise he could never get through his work at all.

On the question of artificial substitutes for daylight much has been said and written by people who really know little about the subject. Most of them consider that if a picture can be seen well in a certain light, or a water color sketch can be done under its illumination, or if it shows "sufficiently well for all practical purposes" the different colors in variously colored bunch of flowers, a colored vase, or collection of natural history objects, then that light is certainly a perfect substitute for daylight" and good for color matching.

For all ordinary purposes of illumination that may do very well, but, for real color matching, such as required in the dyehouse or color laboratory, it is of no use whatever. The delicate and exceedingly sensitive shades we have just been studying, would appear altogether different under such illuminants. This vague and untruthful way of speaking and advertising has done much harm to the few really good color matching lamps in the market, because manufacturers, who have tried the many advertised and self styled "daylight substitutes," have been disappointed with the results. A light may be quite good enough for viewing paints, pigments, enamels and all such colors, which show a minimum of change under any artificial light; and yet be totally unsuitable for examining *dyed shades* on wool or silk. This fact, and it is an important one, seems to be either overlooked or unknown with some writers on the subject of color discrimination in artificial lights.

And now, for the guidance of any of my readers who may contemplate purchasing a color matching lamp, let me give what I consider the only reliable and authoritative test for the color matching qualities of a light. Let there be examined under its light a few of these super-sentitive shades we have been studying in this article; shades dyed either upon wool or silk; and if they appear identical under light as in daylight, then you may safely assume that the light is an excellent substitute for day light. The most severe and critical test that can be applied to any color matching lamp is to examine under its light two dyed shades, each made up of different color constituents, *matching closely in daylight, but appearing widely different under gas or lamp light.* Really very few lamps, indeed, can pass successfully through such a severe test. Such brilliant illuminants as the electric arc light, incandescent electric filament lamps, (carbon and metallic or Tungsten filaments), incandescent gas light mantles, or acetylene gas light all fail to pass this standard.

ELECTRIC ARC AND DAYLIGHT SUBSTITUTES.

The clear brilliancy of the electric arc light forms a most suitable basis for producing what might be termed artificial daylight lamps. In examining all kinds of shades —pigments and dyed colors—very carefully under the electric arc light, it will be observed that there are now and again considerable differences in appearance from the daylight aspect. The effect produced is that of a slight deficiency in the blue and violet rays; or what comes to the same thing, the shades appear as under a very slight predominance of the red and orange rays. In order to overcome this effect upon colors several patent arc lamps have been introduced with a glass screen or globe suitably tinted into a special tone of blue which has the property of absorbing or quenching those particular red rays that cause the modifying effect upon colors. By careful selection of the tinted screen or filter, the results obtained are good and approach closely to the color of daylight.

The first lamp built on this principle was introduced by Dufton and Gardner, of England, both color scientists of repute; the latter being Professor of Dyeing, and Principal of the Bradford Technical College. Since its introduction many years ago other lamps, based on the same idea, have been put upon the market, with more or less success.

The investigations of Dr. Herbert E. Ives, of Philadelphia, and Dr. Kenneth Mees, of England, have done much to elucidate the many practical, as well as purely scientific, difficulties arising out of the questions of artificial illumination and color absorption and to both we are indebted for useful color matching lamps.

THE "DALITE" LAMP.

The Dufton-Gardner lamp, known commercially as the "Dalite" lamp, is an electric arc light enclosed in a globe made of a special kind of blue colored glass. The exact color of this glass was arrived at only after long experimenting with different colored screens and dye solutions. It was found that a specially manufactured glass, colored blue with an oxide of copper gave exactly the required absorption of those colored rays, necessary to convert the arc light into a pure daylight. Of course, it has to be remembered that all such lights passing through absorbing media like colored glasses, or stained gelatine filters, lose a large percentage of their illuminating power, but the resulting light is quite sufficient to examine all kinds of shades and dyed materials.

Other lamps on the same principle are the "Coltru" color matching arc lamp; the "O. I." lamp; and the Benjamin "Daylight Unit" lamp with Wratten screen as recommended by Dr. Mees. This consists of an ordinary tungsten lamp, covered with a mat steel reflector and a special color screen known as a Wratten filter, which is said to convert the light into a close resemblance to daylight. Not having had an opportunity of personally testing this light for myself, I cannot express an opinion as to its merits in the matching

of dyed shades on wool or silk; but I am informed that it acts satisfactorily.

THE "IVES DAYLIGHT PRODUCER."

Of special interest is this lamp, invented by Dr. H. E. Ives, a high authority on illumination and scientific adviser to the Welsbach Company, of America. It is based, not on the electric arc as the source of light, but on ordinary gas with a special Welsbach incandescent mantle. This "Daylight Producer" is very successful in rendering exactly the daylight effects on all kinds of color, including those specially sensitive and changeable dyed shades we have been studying in this article. By the aid of this lamp it is possible to reproduce, by means of special mantles, either a "pure sunlight" or "a blue sky light" effect. The lamp is of special construction. It has an "Ivelite" gas mantle, containing a special proportion of ceria in its composition, an aluminum reflector, and a special bluish-green glass filter, combined with another glass, or gelatine film colored with a particularly fast purple color. The whole is fitted to a specially constructed box, into which the artificial daylight is reflected from above. In this illuminated cabinet all kinds of colors and dyed shades can be readily examined, and their daylight appearance accurately judged.*

The quality of this artificial sunlight for color matching purposes has been severely tested with specially sensitive dyed shades on silk and wool and it has come through the trials successfully. It has shown their daylight appearance with the utmost satisfaction.

MAGNESIUM LIGHT.

In dyeworks and color loboratories that possess no electric light, a most useful substitute, during the dark winter nights, is found in burning a small piece of Magnesium ribbon. The white dazzling light it emits is very suitable for taking a rapid view of any shades which cannot lie over till daylight comes in. The experienced eye of the colorist can tell, in the short time it takes to burn some six or eight inches of the ribbon, if the shades are sufficiently on the standard; or if not, what alterations they may need, in order to keep them as nearly correct as possible, until daylight returns, when they can be more minutely examined.

YELLOW TINTED ILLUMINANTS.

All the ordinary artificial lights, possessing as they do a greater or less predominance of red and orange rays, must be classed outside the small group of really useful color matching lights. Even the beautiful white lights of the incandescent gas, or mantle; the acetylene light; and electric filament lamps are not sufficiently pure or day like in their effect as to warrant their use where careful color discrimination is necessary. They all possess an excess of orange and red rays; in some cases but slight, yet sufficient to upset the appearances of exceedingly delicate dyed shades. Their effect on the aspect of colors is of the same nature, though much less in degree, as the ordinary orange tinged illuminants like coal gas and candle light.

*For a special description of this new light see "Lighting Journal" of May, 1913, page 131. ("A Gas Artificial Daylight").

E. C. Green, a cotton expert of the United States Department of Agriculture, has entered into a three-year contract with Brazil and will leave shortly for that country to conduct experiments by which Brazil hopes to increase its cotton crop. There is a vast territory in the eastern equatorial part of the country, which it is believed, will yield excellent crops of cotton. He will also develop other crops.

OVERCOMING FAULTS IN DYEING.

It often happens that in spite of all the care and precaution that may have been exercised, faults arise in dyeing. The goods come out too deep in shade, unlevel, spotted, or not properly matching the standard pattern. Faulty lots, when they do occur, require to be handled subsequently with great care, so that when the faults have been remedied the goods shall not show any apparent signs of the extra treatment they have passed through and shall still be serviceable for the purpose originally intended. It is, therefore, necessary that the fiber or the cloth shall not have been in any way weakened by the "cobbling" operations; woolens shall not have been felted; and silks and half-silks shall not have been impaired in point of brilliancy. In other words, the characteristics proper to each fiber or textile fabric shall not have been altered. In the majority of cases of re-dyeing, satisfactory results may generally be expected when the operations of stripping and of re-dyeing have been properly controlled according to the dictates of experience. In large establishments where it is the custom to keep large stocks of the gray material, it is often possible to pass on badly dyed goods to be dyed some deeper color and to take fresh material to replace the faulty. Wherever it is possible, this course is a very convenient one, and is also the more economical; but it is not always available.

The methods to be adopted for the remedying of faults depend upon the nature of the material: (1) vegetable fibers (cotton, jute, linen, ramie, hemp, and artificial silk); (2) animal fibers (wool and silk); (3) mixtures (wool and cotton, silk and wool, silk and artificial silk). Materials composed of the vegetable fibers may have been dyed (*a*) with the acid and azo coloring matters; (*b*) with the basic dyestuffs, mordanting with tannin followed, or not, by fixation with tartar emetic; (*c*) with the direct dyestuffs; (*d*) with the developed coloring matters; (*e*) with the alizarine dyes in oiled material mordanted with metallic salts. The dyeings on vegetable fabrics made with the acid and azo dyestuffs come into consideration only on special occasions, as these dyes are used solely because they give a brilliancy of tone which cannot be otherwise attained. They are mostly used on ribbons for the production of shades of cream, pink, claret, and red, and for this purpose there are eosine, phloxine, erythrosine, croceine, scarlet, etc. These dyes are generally applied from a warm bath strongly charged with sulphate of soda, and the material after dyeing is at once squeezed and sent to dry without being washed. They are not fast to washing, and often appear bronzed when dried. The remedy for any faults is therefore a simple course of washing and of re-dyeing. Most of the other coloring matters named may be regarded as fast to soaping. With these, the remedying of faults consists in treating the dyeing with a solution of bleaching powder and then of acid, stripping with hyraldite or with acidified bichromate of potash. Stripping with bleaching powder solutions gives satisfactory results in a large number of cases. The faulty material is worked for a short time in a warm but weak solution of chemic, and then without washing passed through a cold weak bath of acid, sulphuric or hydrochloric. A course of this treatment usually suffices to cause total decolorization, but should this not have taken place, the operations may be repeated. After souring, the material requires to be washed and is then treated with soda

to neutralize the acid, and to remove any traces of hypochlorite. After washing again the goods are ready to be re-dyed. Those coloring matters which are fast to chlorine can usually be stripped by means of hyraldite. Faultily dyed material may be very satisfactorily stripped with this agent by applying it at a temperature of 75 to 80 deg. C. The goods require, however, to be manipulated for about half an hour.

To effect the removal of traces of hyraldite and of the odor from the treated material washing is succeeded by treating for a short time with a warm but weak solution of bleaching powder, or with a solution of peroxide of soda, or acidified bichromate of potash. In some circumstances, treating for half an hour in a warm solution of acidified bichromate suffices to prepare the material for re-dyeing, without any previous treatment. The re-dyeing of fabrics composed of animal fibres presents more danger and complications, and requires more time than the re-dying of cottons, etc., calls for, because the wool fibers tend to contract, to felt, and lose some of its appearance by the treatment. The acid and azo dyestuffs are usually applied to woolen materials for ladies' cloths, and with these it often suffices to treat with a boiling solution of sulphate of soda or of ammonia with the object of affecting the removal of the color. Stripping by means of a warm solution of soap when serviceable is rather to be avoided, because of the liability of causing the felting of the fibre. Silk materials are generally dyed with the aniline or the naphthaline dyestuffs, and when these have to be considered decolorisation of the dyed material may be brought about by treating with a warm solution of washing soda, containing also a very weak proportion of caustic soda. In some particular cases this treatment may not turn out satisfactory, but should this arise it may be followed by treating with hyraldite at 45 to 60 deg. C., and then with peroxide of soda. Wools dyed with fast colors require special consideration. It is necessary to ascertain beforehand whether the coloring matter used is destroyed by oxidation or by reduction, or, in the case of mixtures resisting the one, whether the dyeing can be removed by both methods.

When reduction suffices to destroy the color, the choice of the stripping agent may fall on hyraldite, and for oxidation on peroxide of soda for light shades, and for medium and dark shades on acidified bichromate of potash. It is not advisable to employ the last mentioned method for the stripping of pale shades, because the treatment discolors the wool. When both reduction and oxidation are required to remove the colors, the two methods are used, the one after the other. Fine and delicate materials of wool and silk that have been dyed exclusively with the acid and azo dyestuffs require varying treatment, according to the fastness of the particular dyestuffs employed. The methods available are treatments (*a*) with warm water, (*b*) with a warm solution of sulphate of soda, (*c*) with a warm and weak solution of soda or of soap. If none of these attain the object in view hyraldite or peroxide of soda should be used. Materials composed of wool and of cotton are generally dyed with the half-wool coloring matters. These are substantive dyestuffs which are pure or which have been modified by admixture with certain members of the aniline and napthaline groups, and which are applied to wool from a neutral bath of sulphate of soda.

The dyeings on half-wools that show a good resistance to washing can only be decolorised with success by the combined use of the hyraldite and the acidified bichromate methods, or of hyraldite and peroxide of soda. In certain particular cases it suffices to treat the material simply by chroming rather strongly with the purpose in view of equalising the color. Cloths composed of silk and cotton are dyed either by the direct method or by the old indirect methods; that is, by first giving the cotton portion a ground color with a substantive dyestuff and then dyeing the silk portion with the basic dyestuffs, or with those of the acid and azo groups. Another method consists in using dyes for silk on material which has been mordanted with tannin.

Defects due to dyeing appearing on the surface of the cloth may be usually got rid of by passing the material through a hot solution of soap. Satins of the better qualities will, however, only submit to a slight soaping. To level up the colored surface of the silk a useful procedure consists in passing the faulty goods through a warm solution of soap and of soda, along with, sometimes, a small quantity of caustic soda.

Should the dyeing on the cotton produced by a substantive dyestuff not be satisfactory (but this should never occur if the proper method of applying the coloring matter has been followed), hyraldite must be used for the stripping of the color. For the re-dying of silk cotton materials that have been dyed by the old method, soaping and washing should be succeeded by treating with a strong warm solution of a mineral acid, so as to completely destroy the tannin-lake, decolorize the cotton portion, and at the same time to remove from the silk the tannin compounds which may be attached to it.

For destroying the colors shown on shot-effect half-silks on which the cotton and the silk have contrasting colors, the best method of stripping is the use of hyraldite followed with peroxide of soda. After stripping the color, the tannin should be removed by treating with a hot solution of mineral acid.

Fabrics composed of artificial silk may generally be treated for re-dyeing by the methods employed for the stripping of cottons. Mixed fabrics of artificial and of natural silk are readily decolorized by the action of hyraldite assisted afterwards by peroxide of soda.

Faults in dyeing are mostly brought about by one or other of the following causes:—(1) Insufficient preliminary preparation of the material to be dyed; (2) incomplete solution of the coloring matters; (3) wrong proportion of mordant, or of assistant in the dyebath, relative to the amount of coloring matter employed; (4) lack of cleanliness; (5) inequality of treatment during the operation of dyeing; (6) careless matching; (7) the use of dyeing liquors charged too strongly with coloring matter, and thus giving bronzed dyeings; (8) allowing direct sunlight to fall on the goods during manipulation; (9) defective mechanical arrangements concerning the dyeing machines. It should pass without controversy that the production of a dyeing beyond reproach is not possible of attainment without a faultless preparation of the material. To carry out the dyeing of piece-goods successfully the operation of singeing should only be entrusted to the care of expert and conscientious workpeople.

Mildew stains come very pronouncedly into evidence on the cloth after dyeing, and are somewhat difficult to remove; vegetable materials may be treated with hypochlorite and animal materials and admixtures with peroxide of soda. —*The Textile Mercury.*

REDUCING THE DAMAGE ACCOUNT.

A Process for Checking the Production of Seconds, or Worse, in the Mill and the Finishing Plant. Practical Suggestions made by one who has Produced Results. Locating the Sources of Trouble and Providing a Remedy.

(Contributed Exclusively to COTTON)

BY "NEW CHAT."

The mill of today that has no intelligible way of ascertaining the amount of damaged pieces, and the good product that goes astray on account of the careless handling in the various stages of manufacturing is practically doomed as far as dividends are concerned. Such a mill cannot be made to pay in these "close" times. Manufacturing practices have changed a great deal in the past twelve years and in order for a mill to be successful financially, a thoroughly reliable system must be put into operation.

It must be known how many pieces are damaged and thrown aside each week as imperfect goods, and these amounts compared from week to week to determine whether there is any increase and if so to determine the percentage of same. These damaged pieces should be graded, where possible, that is, sub-divided into good seconds, fair and poor, so as to get a better price for the good seconds when possible. At one time I was engaged to assist in putting the finishing department of a large mill on a systematic basis in regard to damage accounts. Some of the things I found and how I managed to overcome them I will now relate.

In the first place, a lot of goods had been returned to the mill as unsalable, because of bad weaving, stains, poor folding, etc. I had the cases opened up and after giving them a thorough looking over, I came to the conclusion that about everybody in the finishing department was neglecting to see things, that is, were allowing everything to pass. An instance of gross neglect showed itself very plainly when I discovered a number of pieces with strings in them. The strings were put in the pieces in the cloth room, while still in the grey, to call attention to a bad place in the cloth. These strings were supposed to be cut off by the finishing room inspector after being looked over and caused to be passed or put in as seconds. It was very evident that either the inspector did not see these, or he forgot to cut them off after looking the pieces over. I thought it was the former cause, and I made sure of it later on. I now had something to work on. I instructed the packers and shipping room help to throw aside all pieces with strings attached that came to them. I next got in touch with the inspector, who was a gay sort of a fellow, nothing worrying him very much. I told him of these goods going on the market with strings in them that were in most instances seconds going out of the mill as first class goods, and that it was hurting the mill and its reputation. His excuse was he was away from his work a good part of the time doing something else, etc. This was very bad if true, and after looking into this statement I found in part that it was. It was then arranged to keep him at his post from bell to bell.

In this mill there were carding, spinning, quilling, weaving, bleaching and finishing departments. The goods after being washed and bleached were delivered on rolls in a dry state to the finishing room cutting department, where they were cut up. After being cut at the headings, they were folded in the half fold and then sent to the machine room to be hemmed up. The inspector was stationed here at the cutting and folding tables, and his duties were to measure and watch out for irregular lengths or widths and pass on any damage he might find himself or where a string was inserted, showing it had been seen in the cloth room. I started in here to find out how much was not seen in the grey in the cloth room, and also how much they did see and mark with strings. What I discovered was amazing. It showed a deplorable condition in the cloth room also.

A large number of bad places that should have been seen, and had strings put in them were passed by regardless of the extent or the amount of the damage. In some there were floats, miss picks, bad selvage, short and long, some were double lengths with no heading in them. There were cuts of cloth that probably had not seen the examining board at all. The most of these were not salable as firsts. It was also plainly evident that the weavers were taking it for granted that any old thing would go past and were well posted along this line by the looks of the cloth. The weavers as a general rule are very quick to find out what will pass and will send the word along to their brother weavers with the result of just what I found at this mill.

It was necessary to make a change in the cloth room at once to overcome these very bad conditions. This was accordingly done. The new man was properly instructed and told of the conditions as they had been, and what they must be in the future. He was told to see everything, for a while at least, and let these weavers know he was "seeing" by calling them to account and charging them with pieces damaged by carelessness on their part and thus bring things to a healthy basis as speedily as possible. Believing we had a trustworthy man now at this end, we picked up the threads again in the finishing department, and proceeded to solve another phase of this damage account. I had forms printed to be made out each day in the week, to show how many pieces were damaged each day, and for what reason. These forms were made out in the manner shown in Fig. 1.

This form of report showed 186 pieces damaged for the first two days. It also shows for what cause and the department charged with the damage. At this rate I would have at week-end about 500 pieces of damaged goods to put on my weekly report. This was startling, yet very true. This was the first report this mill had ever seen of how much of their product was not salable as firsts, or that really came under the ugly name of seconds.

A word here as to the old methods employed in handling the seconds and disposition of same would not be amiss There may be other mills with a system like the one I am describing, and the sooner they change this hap-hazard, get-

them-out-of-the-way-quick, method of handling their damaged pieces, the better showing they will make.

With the old system that had been in vogue for a number of years when the pieces were damaged and called seconds they were thrown to one side on a spare table, and after a large quantity of them had accumulated they were bundled and packed away. This bundling was done by bundlers borrowed from the shipping department and, of course while doing this work, their own work fell behind. They caught up in their work by rushing things along and making a good number of unsightly bundles in doing so.

Another bad feature of this method was the fact that the inspector did not have any idea how many seconds there were, what kind of damage they contained and the expensive classes were all mixed in with the others of cheaper grade. All they seemed to know, or care, was to hustle them out of the way, to make room for just as many or more to come. This was the system (?) that no one in particular seemed to be interested in and it was a very bad one. There were pieces in these bundles that could have been

DAY Monday and Tuesday DAMAGE REPORT DATE 6/12/10

FOR	DEP'T.	AM'T.
OIL STAINS	?	5
FLOATS	Weave	11
BAD SELVAGE	"	8
OILY FILLING	Spinning	7
TORN	Bleaching	4
COARSE FILLING		
MISS PICKS	Weave	18
COARSE FILLING		
SLUBS	Carding	28
YELLOW	Bleaching	13
BLUE	"	17
DIRTY SELVAGE	"	15
HOLES	"	5
DIRTY	Finishing	10
BAD WEAVING	Weave	45
TOTALS		186

FIG. 1.

saved to the concern if some one knew to what extent they were damaged. Imagine a piece falling on the floor and getting dirty in the finishing department and then the party who dropped it would throw it into the seconds pile. This was a common occurrence. These could be brushed off and sent back and washed in the bleach house and would have come back as good as new. This was never done, however.

After being bundled up they were packed away in the basement in boxes made for the purpose. A buyer representing a large dealer would then come along and buy them all up. He must have done a very profitable business along this line, as there were a great many he could dispose of as "firsts," or good, salable cloth. So much for the old way of doing things.

We now knew how many were damaged the first two days, what the damage consisted of and the pieces properly labeled and set to one side. Also each department was charged with the damaged pieces according to the appearance of said damage. A small gum label ticket on each told at a glance, just what the damage was. These reports each day were made out and at the end of the week a weekly report was made out, and showed a total of 380 pieces damaged for the week. The product of the mill was 14,000 pieces weekly, thus the damage was nearly 3 per cent. That is, 3 per cent of the production was not salable as "firsts." Previously this would have been worse as they would have been jumbled together regardless and then sold at a great loss.

The gummed labels that I used were locked up and used only by me. This was done to prevent anyone other than myself from putting any pieces in the "seconds" pile that had not been through my hands. If a piece was damaged in any other part of the room and was thrown in with the other seconds, the absence of the label on the outside was sure to cause a "looking up" of the party who put it there and for what reason. By this system there was much less cloth used for purposes for which it was never intended, viz., towels, aprons, dust cloths and the like. These labels proved an effective check to all carelessness in handling the goods after being delivered to the finishing department in perfect condition.

This weekly report showed as nearly as possible what they were damaged for and the department charged with the damage. The carding department was charged with the slubs, or thick places in the roving. In this case we were using filling made of roving on quills. The spinning department with oily filling and some "tr" the slubs. The weaving department with floats, bad se...ges, miss picks, etc., and the bleaching department with torn selvages, dirty selvages, yellow and blue spots and shades in the cloth, and holes. The finishing department with dirty pieces, due to careless handling, dropping on the floor and for reasons before stated. The oil stains were not charged to any one department at this time, as it was not possible to place the blame. This feature was followed up closely and traced to the bleach house and were charged to them afterward. The report was made out like table shown in Fig. 2 and called the Weekly Damage Report.

WEEKLY DAMAGE REPORT DATE

DAY	CARD	SPIN	WEAVE	BLEACH	FIN'G. ROOM	TOTALS
MON.	14	8	30	23	25	100
TUES.	17	11	24	20	14	86
WED.	10	4	10	14	3	41
THURS.	11	8	11	19	6	55
FRI.	7	7	22	17	8	61
SAT.	6	2	11	14	4	37
TOTALS	65	40	108	107	60	380
PROD	14000					
PERCENT	2.7% or nearly 3% damaged					

FIG. 2.

In this table it will be seen that for the first two days the damage was very large. This was on account of cleaning up every piece in sight and starting in right to keep track of all new seconds. By the end of the second day we had caught up with the bleaching department and could

then get closer and possibly prevent some damage by reporting at once any serious fault, to the respective department overseers. That this was a very valuable point in the fight against the damage account goes without saying. This was not possible with the old way as they were always behind four or five rolls and sometimes a whole day in the cutting and inspecting and this fact made it impossible to get at things quickly and have them righted in the succeeding rolls. This relates mostly to the bleach house damage, such as dirty selvages, black oil, wet and rust stains. These being reported as soon as found, served to "wake up" the man on this job and as his overseer got a report each day as to how many were damaged in this way, it was imperative that he tend to business. The future results along this line were gratifying, indeed, and helped in a great measure to bring the percentage of damage down to a very low estimate. I am not stretching the truth a bit when I say that on all the reports, both daily and weekly, the most interesting feature, and the one thing these overseers looked at first, was that percentage of damage. Did it go higher, or did it come down a little?

On the weekly report we have first, the carding department charged with 65 "slubs" for the week. Some persons prefer to call these "slugs" or "bunches" in the yarn. The filling used in this instance was made from roving and put on quills. This damage then was justly charged to the carding department. The overseer was given a report showing how many were damaged in this manner, and also shown pieces with this damage in them. He was also promised a report every day in regard to this damage, showing him the progress he was making along this line. The very next week showed a big improvement. In fact, the result of his looking into this part of the damage began to show at once, as the next report showed a decrease toward the week-end. This also showed me the great possibilities of this system, if properly followed up by each overseer. It was far reaching and began to look like a feasible plan to work out, and certainly a great saving was to be made if it was properly handled.

To further show how valuable this "follow-up" method proved to be, I will tell of an instance of tracing a certain class of damage called "pulled threads." I had been on the job about ten days when this new damage started to show up. After studying it closely and showing it to the boss weaver, we decided these pieces, which were of a honey comb pattern, were getting caught somewhere between the cloth department and finishing department. The bleach house overseer was notified and he found a number of wooden reels that the cloth was run over from bin to bin, with nails sticking out of them and another one with one of the slats split and a large splinter of wood in the direct path of the cloth. These were remedied and the damage was less, but did not entirely stop. Continuing the search still further, I visited the cloth room and found the same thing, viz., these "pulled threads" before being sent into the bleaching department. The men who were piling the cloth up were questioned and after looking around a bit an old pair of shoes were found with the soles pulled off and a large number of nails sticking out. One of the men had been using them right along and he admitted he changed them because they kept getting caught in the cloth. After this we had no more pulled threads. This amply shows what a good system and intelligent "following up" will do in any mill.

All of our damages were threshed out in this manner. Every damage was studied carefully and noted and where possible a remedy supplied at once. There are a great many mills today that know a certain damage is showing up in their work from time to time, but no real honest effort is ever made to correct it. There are so many ifs and ands about it, and so many alibis ready, that they tend to kill a near approach to the cause of this trouble, so much so that it is very discouraging at times to attempt to bring it home and correct it for all time. But, it can be done by an impartial accounting of each damage, and also each damage given consideration in its proper turn, and finally by a "getting together" on the part of the overseers. This honest cooperation between the department heads brings about the happy result of being able to read on the week-end report, "No more damaged on this account."

The next item on the report is the spinning department charged with 40 damaged on account of oily filling and coarse filling. A few of these were laid to one side and the spinner called to see them. He in turn called his assistants and showed them the damage and also his report, showing how many were charged to his department for the previous week. He instructed them to be on the lookout for this oily filling and coarse filling and put a stop to it as soon as possible.

The weave room damage was very large and the chief reason for this was the weavers doing poor work and the neglect of the cloth room overseer and inspectors to properly inspect and to use stringent measures to stop this indifferent weaving. We need not dwell here any longer, as I spoke of this part in our fight against the making of seconds in the first part of this article. The overseer of weaving got his reports every day and also the weekly report and was shown a sample of the damage each time he came to look it up, after seeing it on his report.

The bleach house damage was also very high, consisting of black oil, oily and dirty selvage, blue, yellow and brown stains, rust stains and holes, as well as torn selvages. The overseer of this department was very desirous of reducing his damage and arranged at once with me to have his damaged pieces laid to one side and he would look them over every week end then try and wash out these stains and send them back to me again. In some cases they were as good as new, and again some others would pass most anywhere as firsts.

This was where we made one of the very best reductions in the damage account. Many a piece was saved from the second pile by this system. I remember very well the returning of 65 pieces at one time to the bleach house and when returned to me again I only had to throw out four as unfit to pass as first-class goods. Now, when it is considered that these same pieces, if treated in the old way, would all be jumbled away in the second bins, the great value of systematizing the damage accounts in this mill becomes at once apparent. Much of what I have said is applicable to all mills, in whole or in part, whether woolen or cotton, silk or carpet mill, some parts of this article will surely apply.

The finishing room damage I have spoken of before and was for the most part careless handling by the employes. Some were dirty, some had tobacco stains, others nail holes, gum stains from the ticketing table, oil from machines, some were used for towels and then thrown to one side, as I have related, and some others used for aprons.

It was not a very difficult task to stop this, and our reports in the future showed plainly that the efforts in this direction were crowned with success. A low percentage of damage was charged against the finishing department, which was my end of the business to look after.

At the end of twelve weeks of hard work by all hands concerned, our weekly reports were very gratifying, indeed. Our damage had been dropping all the time until now we were having some days with nine damaged pieces and then fourteen and then again only four pieces a day. The week-end reports were reading 29, 36, 41, etc., a truly wonderful showing for the time involved, when the conditions under which we made our start are taken into consideration.

In closing this article, I wish to state in very strong terms the urgent necessity of each and every mill having a daily and weekly report of pieces damaged. Their cause and where damaged and to follow up each particular damage until you have it "nailed to the mast" so to speak. Get each overseer interested in the little figures on the reports called percentage of damage. When these things are followed up and the percentage of damage is low, there is a healthy contented feeling all through the plant, and this fosters only one result, namely, the making of *good cloth*, and under these excellent conditions a very profitable business for the mill is assured.

The reduction of the damage accounts in textile mills is an art of long standing, and with many devious ways for obtaining the same. But the real road to success in this art is *consistency*. Keep at it. Don't try it for one week and then throw it into the discards. Don't show the boss weaver some fearful looking cloth, when the weaver who made the cloth has grown old since the making. Keep close to the work. Don't allow things to drag along "any old way" in the finishing room. If you are close to the weave room product each week you are bound to find some things in time to prevent their recurrence later and save the company many dollars where it would have entailed a heavy loss. Install a good, reliable system in your mill, bring this part of your business to a healthy, normal condition, and reap the happy returns at the end of your fiscal year.

GENERAL EFFICIENCY IN DYEHOUSES AND BLEACHWORKS.*

BY DR. L. J. MATOS.

It has well been stated that the enemy of waste is efficiency, whether of labor or machinery. If the kind and character of labor engaged in any work is of the highest order commensurate with the character of output, just so high will be its value, and likewise, if the tools and appliances made use of in forwarding the raw material from one process to another are of the highest possible type suited to the purpose, so again will the condition and quality of the output be high in proportion.

Perhaps in no industry is the force of the above statements more apparent than in the conversion of raw textiles into finished fabrics, whether they be cotton, wool, or silk, and in no subdivision of these industries more so than in the dyehouses and bleaching plants. Other departments of textile mills contribute their share of skill to the value of the ultimate fabric, notably the finishing department, which has more to do in the physical handling of the goods than other departments, and consequently its treatment may be safely omitted at this time.

The dyehouse of a modern textile mill is in reality a huge laboratory where the raw stock, yarn or piece goods of whatever fiber made is colored to meet certain commercial demands. It is in this laboratory that the material to be dyed is generally prepared for the actual dyeing operation by such treatments as will better enable it to take the mordants or dyes as the case may be. This preparatory treatment consists in the majority of instances in cleaning or scouring the goods free from all extraneous oils, grease, dirt, etc., that become attached to it unavoidably in its passage through the mill, or which may have been added to it internally, such as oils in the case of wool. Consequently it stands to reason that if the dyer is expected to turn out good work it means that the goods delivered to him should be clean; that is, thoroughly scoured out, or boiled out, with either soap or soda according to the stock, and then finally rinsed. Here the lack of efficiency in many woolen mills is painfully apparent; through misdirection or otherwise, scouring in alkaline soap liquors is pushed to the limit under the mistaken idea that hard punishment of the pieces is the best means of removing oils and dirt; this is followed by failure to give the best part of the scouring—the final ample washing in water so ample as to remove all traces of the emulsified oils and the emulsifying soap liquors. Absolutely false economy is experienced by such treatment of woolen or worsted goods, for the reason that traces of soapy liquors remaining are the unmistakable causes of so-called cloudy or streaky goods; defects that cannot be removed and can only be hidden by over-dyeing with other and heavier shades or by stripping and re-dyeing. Two definite results are then obtained: (1) The goods are not of a level shade, and consequently, if otherwise acceptable, must be sold at a lower price than they would normally command; (2) If they are stripped and re-dyed, other conditions of feel, handle, texture and shade being equal, the time and the cost in re-handling and re-dyeing are absolutely lost, and cannot be recovered from the buyer.

Efficiency in the preparatory treatment of woolen fabrics therefore resolves itself into thorough scouring and perfect rinsing, without which no piece of goods is ready to be dyed. Perfect scouring, again, brings pointedly before us the necessity of having good water to scour with. Some mills are so favorably situated that their water supply is of very low hardness and generally free from suspended matter, but, on the other hand, there are many mills that have only a moderately soft water and some where it is liable to be contaminated with much silt. Where the water is clear and soft, or moderately so, no bad effects are to be found in the goods due to the water, but under the mistaken idea that cheapness is an element of economy, some mills having an unlimited supply of good water use mill soaps of the lowest grade, rosin filled, with the result that the characteristic odor of rosin persistently remains with the goods, whereas if even a fair quantity of tallow soap had been used, the goods would at least be free from odor if well rinsed.

The importance of water softening in connection with dye and bleach works has not reached the position it deserves, but as competition increases among textile mills, and

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the demands for relatively better fabrics from a constantly discriminating public increase, the mill that aims to meet these particular demands will be the mill to avail itself of every scientific help. It is a fact that there are today otherwise practical mill men who conscientiously believe that the tenaciously adhering lime soaps, the result of hard water, are effectively removed in a competitor's mill and regard with sincere distrust the statements of chemists that such deposits when formed on wool are irremovable, when such deposits are found on woolen goods in their own mill. Irrespective of the saving in the cost of soap, which could be credited to increased scouring efficiency, the amount so saved would in many mills be the interest on the money invested in an effective water softening plant.

Modern ideas in textile machinery have in general kept pace with other improvements, but there are many large mills that, years ago, turned out goods that held a prominent place in the market, but now these do not meet with the same favor as goods from other mills. On examining the cause of this condition, we are confronted with the fact that the machines used are of types long since discredited and abandoned. This applies to scouring as well as to dyeing. The old type of woolen goods washers, found in many mills, depended upon their harsh and energetic treatment of the cloth itself, leaving the solvent and detergent action of the soap and alkalies used to take care of themselves, whereas the more advanced type of appliances is so constructed as to give the soapy liquors the very freest action, without in the least impairing the condition of the cloth. Scouring of woolen goods is essentially a chemical process and not a mechanical operation.

Economy in the dyehouse proper may be effected along various lines, but each should be so considered that it fits in perfect accord with all other lines, so that there may be a maximum output of clean dyed goods ready for the dryroom or finishing department.

Dyehouses in which the labor, that is, the so-called kettle hands are not identified with their work, can never work as smoothly as those where the workmen are made to feel that they are a part of their department. Perhaps in no other department of a mill is the personal equation so much in evidence as in the dyehouse, and it should be the one where there is the least discord.

It was formerly the case that the master or "boss dyer" struggled under great difficulty to acquire his fund of information and this he, perhaps with good foresight and intention, preserved with great care to himself. He was on close personal terms of intimacy with his several helpers, the most ambitious of whom, ultimately and in turn became a "second hand" and was taught the principles of the trade, which in reality were the names of the "drugs," from whence obtained and how prepared for dyeing. This condition of affairs held up to the discovery and introduction of mauve, Perkin's discovery, from which time to the early eighties the so-called secrets of the dyers have gradually vanished, due in a great measure to the immense amount of practical technical data that is freely disseminated to all inquiries by the large color manufacturers. Consequently, the dyer of today is a much better technically informed individual than his earlier prototype, of which latter, however, there are a few still holding over; while realizing that important discoveries have been made, they still endeavor to convince themselves that the older methods were the most ideal.

Dyeing efficiency means getting the most out of a dye or given group of dyes. This means that the dyer should be sufficiently well informed by study and experience gained in a laboratory, to be able to recognize when a dye is yielding its best, and not stop at being merely a shade matcher. It is just here that the management of mills fails to secure proper efficiency in their dyehouses, believing that output is the only factor by which efficiency can be safely judged.

The purchasing department of a mill, notwithstanding the great amount of really valuable and authentic literature that is freely placed at the disposal of the color makers, cannot be expected to be fully informed as to the properties and characteristics of dyestuffs, as it requires special knowledge and training. To be intelligently informed regarding identity, tinctorial value and other properties requires laboratory aid of various kinds and a true index of mill efficiency is the use made of a well ordered laboratory.

One very large mill is gradually solving the problem of dyeing house efficiency in a manner that should serve as a model for all textile mills using alkaline dyestuffs.

The equipment of this laboratory comprehends every phase of color testing, not only for the matching of dyestuffs, but also for print tests. The system adopted is one which is perhaps the most practical that could be selected. Dyestuffs submitted to it are classified according to color and as nearly as possible according to shade. They are then dyed upon their standard woolen yarns, parallel shades of the same percentage strength. The object of this test is to determine whether or not a given dyestuff is stronger in tinctorial value than another. This test is supplemented by a further test showing the money value of two or more dyestuffs, the object of this series of tests being to ascertain whether, color for color, one dyestuff is cheaper or more costly than another. After having determined the relative tinctorial values of the series of dyestuffs, dyeings are made to show approximately the same shade and depth of color; then the yarn suitable is wound on cards of a few inches in width with bands of the several dyed skeins and these exposed to the light for successive periods of seven days. The result of this series of tests then shows conclusively what dyes resist to the best advantage the action of direct light and those which succumb to this treatment. The entire system of testing dyes by this apparently complicated though very systematic method works out to the very best advantage of the mill; when the results are placed side by side, the chemist, the dyer and the designer have at hand all the available technical information necessary regarding the utility of any one particular dyestuff, and are consequently in a position to eliminate, according to the laboratory tests, dyestuffs which will not withstand the later and detailed processes upon the finished fabric. This particular phase of the laboratory's work serves as the most important lever to the dyehouse desiring to give the greatest efficiency to its mill.

A careful, systematic and thorough examination of any dyestuffs or groups of dyes of apparent value in a mill coloring textiles can be satisfactorily ascertained only by subjecting them to other kinds of tests that technical practice dictates. After having survived the intelligently conducted tests in the laboratory, the survivors may then be passed to the large laboratory, the dyehouse, or the print works with the fullest confidence on the part of the dyer or color mixer.

In the mill in question not only are the dyes so thoroughly tested, but the compound shades in which the fittingly surviving dyes are used are also made in the laboratory, the exact proportions being worked out and submitted to the designer. If the shades so produced pass the scrutiny of the designing room, all the information necessary is then passed on to the dyer who makes use of the foundation formula, worked out in the laboratory; this results not only in a great saving of time in the handling of goods but also in economy of dyestuffs. The surviving portion of the skeins, print tests and exposure tests are systematically filed according to color, and are open to access to every one having business with the colors.

The buyer in this mill is consequently in a position to discuss intelligently, and in the best interest of his employers, the question of dyestuffs, and consequently is in a better position to judge on the merits of the various colors after having passed through such a systematically conducted and well ordered laboratory. Generally, the laboratory of a mill has been regarded as a needless expense, itself in the class of non-producing departments, but mills striving to maintain a position in the forefront of manufacturing excellence are beginning to regard a well directed and properly equipped laboratory as one of the most valuable additions to an intelligently directed purchasing department. The two must go hand in hand.

As a general rule, American mills have not been as prompt to look into the merits of the various types of dyeing and bleaching machines and other apparatus designed to facilitate these two important operations, as have European concerns.

Without specific reference to any type or system, there have been brought to successful operation various forms of dyeing machines that are a great advance over the usual kettles and other appliances used in dyeing; the installation of these tends materially towards advancing the efficiency of the dyehouse.

It is a matter of fact that any dyeing or bleaching machine that conserves the condition of the textile material under treatment, other things being equal, is the ideal machine to adopt. When the mechanical handling of textiles during the bleaching and dyeing operations was first given attention by engineers, the one serious difficulty encountered was the very defective physical condition of the finally dyed or bleached material. These defects, however, were gradually overcome by means of various expedients so that at the present time there are a number of machines in use that imitate identically the best results that it is possible to secure by means of hand work.

This type of machine is included in rather a wide group of others embodying the broad principle of working the material to be treated in the dye or bleach liquor, and generally requires a larger volume of liquor than other forms of apparatus.

Another group of machines are those based on the broad principle of circulating the dye or bleach liquor through the material to be treated, either with or without pressure, the result of which is that the dyeing is accomplished without any disturbance whatever of the condition of the material. In the early days of this type of machine, many set-backs were encountered, due chiefly to lack of penetration of the material by the liquors; thus many such machines were generally condemned. As experience was gained, it was found that the defective results were due entirely to a total lack of knowing how the apparatus should be loaded and packed; loose and indifferent packing always caused uneven results, while hard and close packing—leaving but small chance for leads and channels—always gave a dyeing or bleaching that was as close to perfect as possible.

Still another class of machines found especially valuable for loose wool is somewhat intermediate between the two general types above referred to, and consists of holding an amount of raw stock without any attempt at packing, and circulating the dye or other solution through it. The result in this case is a thorough dyeing of the fibers without any felting—a most serious evil, especially when handling the middle and higher grades of wool.

Reference to these mechanical aids to the dyeing and bleaching operations is made only for the purpose of drawing attention to what does exist, and the fact that there must be a demand for them sufficient to induce inventive dyers to go beyond the usual antiquated apparatus. From the common open kettle for skein yarn, in which the yarn is turned by hand, and which is in use today in many mills, to the crudest type of mechanically operated yarn kettles is a long stretch, but the later devices are gradually growing.

For years, and even today, the usual custom of handling warps in the dyehouse is with open tubes and "boxes," through which the warps pass under and over submerged rollers, and it has only been of recent years that serious attention has been given to the dyeing and bleaching of warps "on the beam" that is, in spool form. The warps are wound tightly to the extent of many thousand yards on a special beam (spool) and by means of proper pumps the liquors are forced under pressure through the mass of wound threads. This principle of bleaching or dyeing is now only in its infancy, and I believe that in time it will be developed into the ideal manner of dyeing. While cotton cloth cannot be successfully dyed by this principle, it is quite possible to bleach by it, and it is not to be doubted that ultimately pieces may be dyed successfully in the same manner.

The textile industry is stimulated by constant competition, mill against mill, and while some mills appear to succeed with certain lines of fabrics, others making similar lines seem to be unable to forge ahead. In quite a number of such instances, careful investigation had shown that the difficulty to be overcome is the stoppage of leaks and losses in the handling of the goods, in and from one stage of operations to another, and by changing from obsolete methods, both mechanical and chemical, to methods that are modern and more in harmony with the spirit of the times. Many dyehouses and bleach works are absolutely non-efficient when compared with other departments of the same mill, and this is due in the majority of instances to the non-progressiveness and parsimonious policy of the mill, and also to the lack of initiative of the department foreman, who lags behind by not applying the advanced advantages of his particular line of work; in consequence, this department also lags behind—a millstone or an anchor—holding back the general progress of the mill. This is the condition that today confronts many of our apparently advanced and progressive mills.

Your mill should be amply represented at the Southern Textile Association convention in Atlanta next November. It will bring results.

INDUSTRIAL EDUCATION.

The question of industrial education is one which has aroused interest in the minds of many thinking men. This is proven beyond doubt by the numerous letters received containing comments of which the following from Senator Carroll S. Page, of Vermont, is a fair sample:

"I have read with much interest Mr. F. C. Myers' article on 'Public Schools and Industrial Education' in the July issue of COTTON. It is a valuable and interesting contribution to the industrial education discussion."

While it seems inadvisable to give too much space to such comments, we believe we should print extracts from at least two of these letters, which heartily support the vital contentions urged by the author of the article. The first extract is from Hon. G. Gunby Jordan, President of the Eagle and Phenix Mills, at Columbus, Ga.

"EDITOR 'COTTON':

"With much pleasure I have read 'Public Schools and Industrial Education' in the July number.

"It is one of the cheerful signs of the times that thinking people, like Mr. Myers, are not only thinking but expressing such forcible views on the subject of industrial education, and the manifest waste there is in most of the schools which undertake to teach a simple academic course.

"In our community many years ago we were convinced of that fact, and Columbus has for a great many years had manual training in its schools.

"But it progressed from that beginning very rapidly. So that for several years the schools, as organized, begin with free kindergartens in every department; then a primary industrial school teaches very many useful branches after the scholars have passed out of the kindergarten. In each grade school manual training has its place, but the main feature of the schools here is the Columbus industrial high school, which does exactly the work that Mr. Myers recommends.

"This school has rapidly grown, both numerically and in efficieney. The graduating class last night at the opera house numbered thirty-five.

"The statistics available show that nearly all of the graduates in the past have continued the work for which they were fitted in school-life.

"The school is co-educational. The girls are taught domestic science, cooking, sewing, dress-making and millinery. The boys have foundry work, carpentry, machinist department and a regular textile organization. In addition to this, both sexes have full courses in stenography, typewriting, bookkeeping and like departments.

"The graduates of this school are practical people, and have to serve six weeks before graduation in some institution in the city in the particular line in which the graduate has sought to be proficient, before receiving a certificate of proficiency from the school. Regular card reports showing the worthiness of the prospective graduate are furnished by the firm employing him during this six weeks' period.

"I have just read a very entertaining pamphlet on 'The Wisdom of Establishing Compulsory Evening Continuation Schools' at Philadelphia. It is very gratifying to state that the different manufacturers and dealers of influence there have approved most unhesitatingly of this suggestion.

"In other words, from year to year we are learning more and more from the splendid organization of the German continuation and industrial school system, and it is having a marked effect upon communities of the United States, and especially of the South."

The second extract is from the letter of Hon. William Schley Howard, of Georgia, who made an address along similar lines before the House of Representatives on the 27th of last June.

"EDITOR 'COTTON':

"It has afforded me very great pleasure to carefully read the splendid dissertation in the July number of COTTON upon the subject of industrial education, by Mr. F. C. Myers.

"The article is a just arraignment of our public school system. It precisely coincides with a speech made by me on June 27th last in the House while we were debating the curriculum and examinations for admission to the Naval Academy.

"Nothing needs stimulation more than our public school system. It teaches everything superficially and nothing thoroughly. A child soon loses his individuality by falling into the rut of "system," and intellectually when our children leave the public schools they are as much alike in training and ideals of life as so many buckshot molded from the same mold. You, I know, have often wondered why the boy who was thrown upon the world on his own resources at an early period in childhood was so much more efficient in the performance of a given task in future years than the young man who was enjoying the opportunities of a finished education—collegiate, if you please, while this boy was out in the world. The explanation to my mind is simple: One was obtaining a practical education in the world of experience while the other was being taught to have an artificial opinion of what life held in store for him. In other words, the boy thrown out in the world was getting the experience of applying his little learning to what the other boy would eventually have to do, who while receiving his education was getting absolutely no practical ideas of what he would have to do in after life.

"Brain and brawn are inseparable. They are by nature interdependent, and the mind and body should be taught to act in unison, and while we are training the intellect the physical man should be practically instructed to execute the mind's conception. To train the intellect in theories only is like running a great dynamo generating an electric current and never making any connections for its use.

"The children of coming generations must be taught that manual labor is honorable. The professions of all classes are today overcrowded, and many men are practicing law, medicine, dentistry, and preaching, and are in politics, who would make better blacksmiths or farmers or dairymen or mill superintendents. The trouble is, our public schools, our private schools and our colleges have a tendency to bend the mind to seek easy avenues in the professions to a fortune. There never was a more fallacious teaching on earth than this. Vocational education should be a part and parcel of our system of education, and I do not know but that I would be safe in saying that if one or the other, intellectual or vocational, should receive more attention, it should be the vocational.

"In conclusion, I only wish to call your attention to the great work being done by the Georgia School of Technology. Just the other day I was talking to a large manufacturer in Washington, and one of the graduates of this school was in the employ of a great corporation in his town, not in a profession, but an expert in the manufacture

of steel, and was earning five thousand dollars per year. The technological school is engaged in vocational education. That is upon a higher scale, but why could not our public schools teach our children how to work and instill into their youthful minds the necessity for honorable toil, teach them along the line of the trend of their ambition and stop this useless, foolish cramming the minds of our children with obsolete and useless learning."

Mill Conditions and Market Reviews.

SOUTHERN MILL SITUATION.

(Special Correspondence.)

With a dividend disbursement of more than one million dollars from the Southern cotton mills during the month of July, and an assurance that these dividends were actually earned, we can find no cause for complaint in mill circles.

The cotton mill men have a pretty good idea of the final shape of the tariff bill, and a confidence in the hope of its early enactment is reflected even now in a brightening of the general mill situation. Things are "looking up" in mill circles. All this may be but a temporary spurt, but the chances are that the present improvement is the forerunner of better times with the mills. The tariff is not by any means what the mill people wanted, but their present concern is to get to work under the new enactment. The general public has a good idea of the provisions of the new bill, but manufacturers will be interested in the change in the tariff on machinery. Under the old bill, cotton mill machinery carried a tariff of 45 per cent. A reduction has been made on this to 25 per cent.

It would seem that the provision in our pending tariff bill which prohibits the importation of goods manufactured wholly or partly by children under fourteen years of age is giving the Lancashire textile manufacturers considerable concern. The Blackburn Chamber of Commerce, representing about four million spindles, has presented an urgent petition to the British Board of Trade, and in this petition they say, "It would mean the absolute prohibition of importation into the United States of Lancashire textile commodities." The British Government therefore is entreated to enter an "effective protest" at once.

We learn from Washington that the first meeting of the committee appointed at the annual meeting of the Southern Agricultural Workers at Raleigh, N. C., in November last was held on July 31st in the office of Senator E. B. Smith of South Carolina. The meeting held in Raleigh was to formulate a plan for bringing about a conference of representatives of the various organized cotton interests of the world to devise some method by which the tare on American cotton may be standardized with a view to eliminating the evils growing out of present tare practices. The committee as appointed in November is composed of Senators Hoke Smith, of Georgia, Smith of South Carolina, Postmaster General Burleson, former Representative W. G. Brantley of Georgia and representatives of the Departments of Agriculture and Commerce. A committee was appointed to work out the details of the proposed conference to be presented to the full committee at a later meeting to be held shortly. The question of speedily bringing about a universal standard for American cotton was also considered, but no definite action was taken.

In talking with Mr. George B. Hiss, president and treasurer of the Rhodhiss Mfg. Co., at Rhodhiss, N. C., and largely interested in the E. A. Smith Mfg. Co., of that place, and lately having assumed active management of the Thrift Mfg. Co., near Charlotte, about business conditions generally, he expressed himself as being rather optimistic, and said:

"Notwithstanding the general adverse criticism on the part of the cotton manufacturers in connection with a reduction of the tariff, I am inclined to the opinion that a downward revision of the general tariff schedule is not only timely, but for the very best interests of the general industrial business of the United States. For years we have adhered to a protective tariff, but we are now arrived at a stage in the history of this country when, in order to meet the changed conditions of business throughout the world, it is necessary for us to put ourselves on a commercial basis to trade with the world at large, and we have been enabled to arrive at this stage by virtue of our protective tariff, which, in my humble judgment, is not longer necessary, unless we intend to ensconce ourselves safely within the narrow enclosure of a protective wall to the exclusion of reasonably fair competition with the manufacturing countries of the world.

"While the present Democratic administration gained the reins of the government somewhat accidentally, and thus represent a minority, it does give the democratic administration an opportunity to evoke into the laws of this country the views of democracy, and this is what a reasonably large percentage of the voters of this country have been demanding for some years past, and thus we will have an opportunity to try out the ideas advanced by the democracy, and should these ideas, and those outlined above, be contrary to the best interests of the country, it will be an easy matter to readjust our laws, so far as the tariff is concerned, on a basis that will be satisfactory, but the days of the high protective tariff are no longer essential to the safe-guarding of the manufacturing interests of this country. Under the revised tariff, when the law goes into effect, the manufacturers of this country will necessarily adjust themselves to the new order of things, and they will be doubtless surprised at the general improved condition of affairs, and realize that they must meet fair competition, and by this it is not meant the pauper labor competition of Europe, but fair competition,—'competition being the life of trade.'

"We have grown under our protective laws commercially and industrially beyond the brightest expectations of the originators of our protective tariff, and why should we have any reason to fear competition when we are in position to enact laws to protect us against unfair competition?

"In view of the tariff discussion, brought about by the changed political aspect of this country, there has been a general slowing up of business, and it is generally believed that the stocks of all manufactured goods in this country are lower than they have ever been before, thus indicating that the general trade has for months been adjusting itself to what they believe to be a change of conditions which will follow the enactment of our new tariff.

"Due largely to the unsettled conditions among the larger nations of Europe, brought about by a fear that the Balkan wars would involve the larger nations, there has been a hoarding of gold in Europe, at the expense of this country, which has necessarily caused a higher rate for money in this country than ordinarily would be the case, and this may occasion, temporarily, a decrease in the value of our highest money-value export product, i. e., cotton, should nature favor us this year with an amount of cotton in excess of reasonable requirements, but we will hardly experience the low price for cotton that prevailed during the Cleveland administration, as everything in this country, due to the prosperous condition of the country, and the enormous amount of gold which has been produced during the past year, has, as it were, inflated values, owing to the plentifulness of gold, and thus cotton at 8 or 9 cents per pound would be, when compared with general conditions, as cheap as cotton was during the Cleveland administration when it sold for a much lower price. The intention is not to draw attention to the Cleveland administration as compared with the present democratic administration, for the conditions are vastly different throughout this country and the world at large, but it is simply thought of in connection with expressing one's views as they relate to present conditions."

E. N. Clemence, a former treasurer of the Eagle & Phenix Mills, of Columbus, Georgia, when interviewed by COTTON's correspondent, had this to say:

"From a purely cotton manufacturing standpoint, we of the South have no past experience of any importance to look back along the lines of cotton manufacturing under a nearly free-trade tariff bill. Years ago when the Wilson bill was in effect, and when the cotton manufacturing industry of the South was comparatively in its infancy, with longer hours of labor, smaller rates of wages, plants comparatively new, it was not so very difficult, under those favorable conditions, to meet competition without sustaining a loss in the operation of the comparatively few cotton mills then existing in the South. In fact, with few exceptions, the Southern cotton mills were rather successful during that period. It is quite different with us now, however, as we are now a cotton manufacturing section of great magnitude and of great importance, our mills consuming, at the present time, more of the cotton staple than any other section of this country and the value of our manufactured product amounting to hundreds of millions of dollars. Truly a great industry, of phenomenal growth. And under just and reasonable tariff laws, the industry ought to continue to grow, as our section contains all the essential elements to make it grow. We have a climate which is unsurpassed for cotton spinning; we have labor as efficient and orderly as can be found anywhere; we have an abundance of cheap power; the raw material is in close proximity to our mills; and the coal fields and iron mines are not far removed. Truly we are a favored section. We deserve to prosper, and should prosper, and will prosper if our tariff laws are just and reasonable, and so framed that the laborer will be protected in this country against the cheap labor of many foreign countries.

"While our labor, as a rule, is efficient, and our rates of wages, by comparison, are exceedingly high, they must remain that way to enable the wage earners of this country to enjoy the comforts and luxuries of life that are now theirs. Under the workings of the new bill, if these favorable conditions can be continued, the country will be satisfied. Otherwise, it will be bad for those advocating the bill and a changed condition will ensue at the first opportunity, which is a fact apparent to all. I am optimistic, however, as regards the future. Our representatives in congress are able and patriotic, and I cannot believe that they will allow our interests to suffer."

Regardless of whether one be in favor of or opposed to the much written-about and much-discussed Underwood-Wilson tariff bill, it is very probable that the same will soon be, for a time at least, the tariff bill of the country, and we shall be obliged to shape our policy along manufacturing lines to conform to the new order of things.

Most of the Southern mills are now sold ahead for several months. Mill men are expecting continued good business, and are planning to take care of it, as evidenced by the following additions to old plants and new mills contemplated:

The Watts Manufacturing Company, at Liledoun, near Taylorsville, N. C., expect to add 6,000 additional spindles to their plant, to provide for a large daily increase in its production of cotton yarns and sheetings. They now have 3500 spindles.

Kahn's Pickery, at 1509 Religious St., New Orleans, will rebuild their recently burned plant.

It is reported that Messrs. Hoover and Allison, of Xenia, Ohio, will establish a $250,000 cordage mill at Kansas City.

The Dallas (Texas) Waste Mills, incorporated with a capital stock of $300,000, have effected permanent organization, and purchased most of their machinery. Their new plant will manufacture jute bagging, and not cotton bagging as at first reported.

The Puritan Cordage Mills, at Louisville, Ky., will install additional braiding machines, and increase their capacity one-fourth.

A. T. Shepherd and Charles K. Bryant, architects, of Richmond, Va., are making plans and specifications for a new cotton mill to be built near Richmond, though they state they are not yet in a position to give out information regarding parties interested.

Brandon Mills, Greenville, are planning to add some new drawing frames to their equipment.

The rumor that the Beaumont Mfg. Co., Spartanburg, S. C., was to make an addition to their plant has been denied by Mr. Jennings, president of the mill.

W. I. Carver, of Celeste, Texas, expects to build a 2,000 spindle mill either at Celeste or Farmersville.

Statesville Cotton Mills, at Statesville, N. C., have placed an order for new roving machinery.

A. C. Phelps, manager of the German-American Co., of Draper, N. C., (controlled by the Marshall-Field combination) states that their mills are waiting to see what effect the new tariff law will have on their business before deciding to replace some of their card room machinery.

The Echota Cotton Mills, at Calhoun, Ga., has placed an order for a large addition to the mill.

The Dixie Cotton Mills, at Mooresville, N. C., have placed an order for additional cards, roving, spinning and cone winders for this mill.

Contract has been placed for a small lot of additional machinery for the Long Island Cotton Mills, Long Island, N. C.

NEW ENGLAND MILL SITUATION.

(Special Correspondence.)

The New England mills closed up the summer months much better than most manufacturers thought would be the case six months ago. The closing of the Fall River Iron Works mills for a period of 15 weeks, until August 25, undoubtedly did a great deal toward steadying the print cloth division of the trade and it certainly had a wholesome effect upon print prices by permitting traders to hold values in a time of dull demand. So well engaged are many of the mills for the next few weeks that the usual summer vacation of ten days was granted at the expense of still further delaying deliveries from some large plants.

The chief recession in values during the month was in the print cloth yarn division of the markets. Recovery came rapidly in the last two weeks, however, and at this time stocks are fully cleaned up and several mills are so well engaged that there will be no further accumulations even if no further business comes forward in September. The price recovery was from a basis of 5¼ cents for 38 inch 68 x 72s to 5½ cents and from a low point of 3⅛ cents on 27-inch 64 x 60s to 3¼ cents. Sales at Fall River in the third week in August reached 240,000 pieces, of which 100,000 were for spot shipment.

The Fall River Iron Works mills have resumed operations in part but will be handicapped for a time in regaining the operatives lost to other concerns during the idle period. This concern has recently ordered 1800 more automatic Draper looms, making 2800 in all the plant will have when present orders are completed. The American Printing Company supplied by these mills now have 40 printing machines, of which 23 are equipped for wide cloths. The passing of the narrow print in the standard constructions seems inevitable so far as domestic markets are concerned.

The opening spring prices named on dress ginghams early in the month were on the same basis as last year, or 7½ cents a yard for Utilities and 9½ cents for Toile du Nords. Staple ginghams were reduced to 6¼ cents from 6¾ cents, and at this ½ cent drop business came along well. Contrary to expectations the Amoskeag Company opened its books again to take further orders for 32 inch chambrays and 32 inch bleached madras, and the orders for these two cloths at 6½ cents net, have been very large and will require the operation of at least 8,000 looms for several months. The bookfold chambray line contains many staple and semi-staple dress gingham patterns and jobbers have applied themselves on them very freely.

The dress gingham markets are not right although the output from many looms will be missing during the coming season. A great many looms have been diverted to fancies in yarn dyed cloths, such as ratine crash, nub yarn effects, and fine shirtings and waistings. Toward the end of the month there was noted a steady increase in the demand for large plaid effects in keeping with the vogue of plaid designs in silks and woolens. This has called for the winding up of many looms to make the very large patterns in dress ginghams.

Bleached cottons have held very steady all through the month and the leading bleacheries have been pushed to deliver goods for prompt use. In many ways it has been a better bleached goods season than has been recorded for some years, but the orders have been for quick goods, and it has been slow work building up a late delivery list. No change has been made in staple 4-4 goods but it has been remarked as unusual that the low count goods such as 4-4 64s have held their values better than is customary in years when bleacheries are running well. The shirt and collar factories and the manufacturing trades generally have bought bleached goods for spot and nearby shipment very steadily all through the jobbers' distributing period.

Wide sheetings were advanced five per cent during the month, and some large sales were made for delivery through the balance of the year. Pepperels are now held at 23 cents net for 10-4 goods and Lockwoods were advanced to 25 cents. Sheets and pillow cases have been taken freely by the visiting retail trade and on leading brands complanits are general of unsatisfactory deliveries. Cambric muslins, nainsooks, longcloths, and the finer lines of bleached cottons generally have sold steadily but in no large lots. This has served to keep prices steady and stocks low.

Prints moved out fitfully. Percales have been sold for advance delivery and new prices for spring will be made next month, or the first week in September. At this time it is expected that 4-4 64 percales may be reduced to a basis of 6½ cents from the top of 6¾ cents, but it is not thought that prices as a whole will be greatly changed. Less business has been offering in prints for export this year than last, but on the whole the export trade has been following the course of the domestic markets in the matter of small orders frequently repeated. Sales of about 1500 bales of Pepperell drills were made for shipment to India at 7¾ cents to meet the pressing competition of Japanese mills whose goods of an inferior grade were being offered at an attractive figure.

On heavy colored goods, such as duck, denims, tickings, etc., the market has held fairly steady and the mills are still well employed on old orders. There has been little or no attempt made by New England mills during the summer to discount a lower cotton price by offering contracts at material concessions from spot values. The general disposition has been this year to follow a conservative policy in the matter of cotton trading until the tariff unsettlement is removed, and to confine business in cloths to the nearby requirements of customers. It has been assumed with some degree of justice that if jobbers are going to order piecemeal lots they should be compelled to pay on the score of retailing, or in other words they should pay asking prices when they are ready to take goods in small lots.

There has been comparatively slow business done on fine and fancy cottons this spring. All fancy looms are well employed for the next two months, and some of course will be busy for many months on specialties, but much less than a normal advance business has come forward from the jobbing and converting trades. Ratines, crepes, voiles, poplins, rice cloths, and other fabrics of a specialty character in fancy effects of many kinds have been ordered in small sample lots, but the reorders to the mills have not been in keeping with the producing capacity on hardly any line. All jacquard looms are engaged for months ahead, but they form but a small portion of the equipment at best.

Prices on plain combed yarn cloths showed some recovery in the last weeks of the month from the lowest relative values that have ever obtained in the American fine goods trade. The advances have ranged from ¼ to ⅜ cent a yard, but even at the advances mills are not seeking business very heartily as there is but little profit to be made with

cotton selling at present prices and combed yarn goods down to a basis of 7 cents for 40 inch 8.50's. The New Bedford mills are still running about 85 per cent of the equipment and Fall River mills are running in about the same ratio. The mills in northern New England making the coarser yarn goods are in much better running condition than the many specialty mills in the Southern section.

Blankets and napped cottons have continued good. Leading blanket mills are behind on their orders still, and jobbers are steadily requesting them to anticipate deliveries. Several jobbers did not cover their normal requirements at the beginning of the year, but sold to retailers in anticipation of securing goods at any time. Owing to the light stocks in hand when the season began, and labor troubles of different kinds at two of the leading mills, normal deliveries have been slow and mills have not been able to catch up because of the steady piling up of spot orders.

The settlement of the strike at the Draper works has been followed by a full degree of activity in the loom departments. Other departments are working on orders. In most of the other large machinery concerns work is slow in coming in. There are orders ahead in several shops and more than an average force is working, yet the machine shops hardly expect to do much until after the tariff is settled. The finishing works have been reflecting the full spot business in the markets. There is business a plenty for quick delivery on sample lots, but it is hard to build up forward orders. The U. S. Finishing Company has practically secured an adoption of its refinancing plan which includes an extension by creditors for a year. Its last report showed that the plants are now making some money.

While there has been much less idleness in the cotton mills of New England than in the woolen and worsted mills they have suffered and are still suffering because of tariff agitation and financial uncertainties. Customers have not been ordering in a normal way and it is difficult for mills to predicate profitable operations on business placed on manufacturing in a retail way.

There seems to be a very widespread idea in the New England section that little or nothing in the way of a wise cotton schedule is to be looked for from the present Congress, and many of the largest manufacturers have concluded to wait and take what is coming in the belief that a political overturn is certain when the public realizes the inconsistencies and injustices of the revision that is now under consideration. A great feeling of pride exists among cotton manufacturers both in New England and out of it, that they have in the Senate a representative of their interests (Senator Lippitt), who is devoting his time to showing how a democratic revision might be brought about in a way to secure the results wanted, but without materially disturbing the industry any more than other industries are disturbed in a time of tariff reduction.

One way to increase your dividends is to send your overseers to the Southern Textile Association conventions. The next one is to be in Atlanta in November. Try it!

American export trade is decidedly a matter of the present, not the future—if other American manufacturers are enjoying its benefits why aren't you?

COTTON CROP CONDITIONS AND A REVIEW OF THE MARKETS.

BY H. AND B. BEER, NEW ORLEANS.

Climatic conditions of late having been unfavorable for the making of a large crop in Oklahoma and in sections of Texas, the market, which experienced a decline of about one-half cent since one month ago, shows a disposition to work higher again owing to the fear of further damage to the crop in the Southwest should the weather west of the Mississippi river remain dry and hot for any considerable period.

The drouth has been very severe in Oklahoma, and the temperature has been excessively high, averaging a maximum of 100 degrees and higher for the entire state for a period of two weeks, and the end is not yet in sight at the time this is written. As a result cotton has suffered considerable deterioration during the past month, and it is now doubtful if the state will make as good a crop as was made one year ago, the increase in acreage notwithstanding.

While Texas has fared better than Oklahoma, the brilliant prospects of one month ago are gradually fading away owing to insufficient rain, especially in the northern half of the state, and abnormal high temperatures. If a good general rain could be had over the state, much of the deterioration would be recovered, and it is probable that Texas would still be able to make a very large crop, perhaps a bumper yield.

Meanwhile, however, there has taken place a distinct improvement in the crop outlook in the Mississippi Valley states, except in Tennessee where there are complaints of drouthy conditions also. Present indications are that the Mississippi Valley states will make the largest crop since the advent of the boll weevil in this section some seven years ago, advices being especially favorable as regards conditions in Louisiana, Arkansas and Mississippi.

The boll weevil has done but very little damage in Louisiana and Mississippi thus far this year, as the farmers have learned how to fight the pest, and have every prospect of making a big crop despite the presence of the weevil.

In the South Atlantic states they have no weevils to contend with, and as the weather has been exceptionally favorable to permit rapid growth, the plant has made splendid progress during the past month, fruiting has been satisfactory, and all of the lateness reported at planting time has been recovered. Present indications are that Alabama and the South Atlantic states will make nearly as much cotton as they made in the big crop year of 1911.

Summarizing general conditions we would say that present prospects are for a yield much in excess of one year ago by at least 1,500,000 bales, and if Texas and Oklahoma receives general rains in the near future, it is not at all unlikely that a record crop will be made, providing, of course, that frost does not appear any earlier than the average date, or say about November 1st.

As to trade conditions, they appear to be improving in the United States. Stocks of shelf goods are said to be at a low ebb, and New York reports the presence of the largest number of buyers of cotton goods in the past five years.

The ending of the Balkan war would lead one to believe that trade in Europe will improve the coming season, and there is no doubt but that it will, which would be reflected

in a better demand for raw cotton on the part of Germany, France, Austria, Russia and Italy.

The internal troubles in China, however, are having an unfavorable effect on English trade, and there is less doing with India, which is England's greatest outlet for cotton goods, consequently trade reports from Manchester are decidedly less favorable than one month ago, the demand from that quarter having been about satisfied for the present at least.

News from India and Egypt as regards the prospects for the cotton crops of those countries are very flattering, particularly so in India where the rainfall has been ample.

THE KNIT GOODS MARKET.

The knit goods trade still continues to be in good shape, and despite some cancellations from some quarters, the re-orders from other quarters are largely counterbalancing any effect this could possibly cause. The opening of the month found manufacturers of heavyweight underwear getting some duplicate business and also found a good demand for carded yarn hosiery for fall. There was some light weight underwear mills idle, but duplicate orders on the heavyweights kept slowly coming across.

The middle of the month found the heavyweight underwear manufacturers still getting duplicate business and the makers of light weight buying yarns for delivery next year. There was still a good demand for carded yarn hosiery and some complaints were received on the part of jobbers of late deliveries on fall goods in the underwear market. This applied, however, more to men's goods than it did to women's lines. Mills making ribbed goods and fleeces were generally reported to be practically sold up for the rest of the season. In cheap ladies' goods some mills could have taken more fall business. Further advanced spring business was also secured in good sized quantities by many of the smaller mills. Southern jobbers were reported to be in the market to a large extent during the middle of the month.

The close of the month found underwear manufacturers in a cheerful mood and some mills ahead of last year's shipment on heavyweights. Duplicate orders were still coming in in a satisfactory volume and carded yarn hosiery manufacturers were reported as well sold up on fall goods. The cancellation of some fall underwear business from a few Western jobbers was, to a large extent, made up by new orders and the cancellations were confined to a section that was most affected by the droth. The satisfactory condition of the fall trade has been the subject of general comment throughout the market. Several important instances of expansion in knit goods mills are being reported and it is understood that the re-organization of the Paragon Knitting Co., of Mohawk, is under the direction of W. C. Schauffler, for 20 years the manager of the Atlas Knitting Co., at Amsterdam.

As a rule the leading mills making ribbed and fleeced goods are practically sold up for the fall season and most of them had a large initial business leaving only a small margin for duplicates. So far as the advance spring business is concerned a few buyers from the South have already been in the market. Some mills are willing to take further spring business, but they are not pressing for it, believing that it will come in due time. One of the latest fashionable demands in the knit goods line is high priced lace hosiery. Many women with money are turning to this fad as the surest way to get something different and something that is not worn by the general populace. A good deal of this high priced lase hosiery has been seen during the present summer in summer resorts, $5.00 a pair for such goods being not an unusual price at present. They are made with regular silk foot, with genuine lace inserted in panel form. It is believed, however, that if this fad continues that by a few simple changes in machinery, this so-called lace hosiery can be turned out so cheaply as to warrant its sale at popular prices. The present prevailing fashions in women's dresses with the tight and split skirt conspicuous, will materially help the hosiery trade to establish a demand for lace effects and other fancy designs in hosiery for women's wear.

The National Association of Hosiery and Underwear Manufacturers have been putting up a stiff fight in an effort to get the hosiery tariff made more appropriate to business conditions in this country, but whether or not it will do any good remains to be seen. If the Senate could be induced to enact a suitable tariff law on hosiery and underwear, it would insure to the knit goods mills of this country a continuation of business along the lines that they have proved to be so successful this year.

THE YARN MARKET.

The yarn market for the past month has been a quiet one. While the July business was of fair aggregate, the business for August has been somewhat lessened, although the prices have been maintained fairly well.

The opening of the month found manufacturers of heavyweight underwear getting some duplicate business and buying yarn for prompt delivery. Light weight underwear manufacturers were also buying yarns for October to March delivery. Southern frame spun cones were being sold on the basis of 20½ cents to 21 cents for 10's for quick spot delivery, while sales of 10's, 11's, 12's and 13's for late August delivery were on the basis of 20¼ cents for 10's. In the opinion of some dealers there is to be a bumper cotton crop this year and with cotton selling at approximately 10 cents in October, they would be able to buy yarn on a paraty with the cost of cotton. On the other hand many of the shrewdest dealers in the market, believed that yarn prices would probably advance to a higher level when the season grew older, regardless of the price of the cotton.

As the month wore on, hosiery manufacturers continued fair buyers and there was a moderate demand for Eastern mule spun cones. Combed yarn prices remained irregular, and a good sized order was the signal for an advance in prices. The demand for 70 two ply and 80 two ply was almost negligible and at 50 cents for 60's two ply cones, there was pretty fair buying and some short selling, but the buying was not large enough in volume to go around. There was a fair demand for single combed peeler cones and sales of about all the numbers from 14's to 44's were made at various prices. The demand for weaving yarns at this peroid was rather quiet, and the buying was chiefly for prompt and September deliveries. It was reported that spinners were well sold up to October. Men's wear trade was quiet.

The middle of the month found the spot demand for 24's and 26's for light weight goods had practically vanished. There was a good demand from manufacturers of

carded yarn hosiery and some buying for future delivery. Sales of Southern frame spun combed peeler cones from 14's to 18's were made on a basis of 25 cents for 10's. 60's single on cones for splicing were made at 54 cents, and 80's single cones sold for 75 cents. The demand for two-ply combed peeler still remained light. The demand for mercerized yarns was also light, and there was some slight cutting on these materials. One sale of 60's two-ply mercerized was made for 63 cents, and another made 65 cents. A sale of 100's two-ply sea island gassed and mercerized brought $1.25. General prices on yarn were slightly lower during this period and many buyers continue confident that yarn prices were going down. There was no accumulation of yarns in the Philadelphia market to force prices down and any weakness that seemed to develop was not due to large stock pressing for sale, but more to a lack of demand and confidence in the present conditions.

As the month closed, some dealers were doing a moderate business in both weaving and knitting yarns. Underwear manufacturers were generally reported to be in a cheerful mood and very few cancellations were being received. There was some buying of 24's and 26's Southern frame spun cones for late delivery. Sales of 26's were made at 23 and 24 cents and 24's cones sold for 23 and 23½ cents. There is little demand for yarn for quick delivery, especially among the course numbers of 14's to 18's, but there was some buying for late delivery. Sales of 10's and 12's Southern frame spun cones for prompt shipment was made on a basis of 20½ cents for 10's. There is a fair demand for single combed peeler yarn on cones principally from 14's to 30's, with the largest demand around 14's to 18's. Some knitters are desiring to buy 14's to 18's Southern frame spun cones on the basis of 24½ cents for 10's, while most of the spinners will not consider anything less than 25 cents. There is not much demand for two-ply cones. Sales of 50 two-ply were made for 43½ cents, 60's two-ply for 49 and 50 cents, and 80's two-ply skeins for 70 cents. The last quotations on 60's two ply mercerized ranged from 63 to 66 cents and 80's two ply mercerized from 85 to 87 cents.

In the weaving line yarns are generally quiet. Not more than 80 per cent of the looms are necessary in some mills. Spinners are generally firm in their quotations and the advances in the cotton future market, while claimed by many old-timers to be due to manipulation, still assisted in holding the spinners firm to their prices. There are many bullish factors in the situation and if the Senate would only straighten out the tangle into which they have succeeded in getting themselves over the cotton schedule, business along these lines would very probably improve. While the currency legislation may have some ultimate effect upon the cotton manufacturing end of business, it has had no appreciable effect at the present time other than to, if anything, assist in improving conditions in the South by the circulation of more actual money due to Secretary McAdoo's recent move. The Underwood-Wilson cotton schedule has been classified by one prominent senator as being "half-baked," which is something that every cotton manufacturer North and South knew months ago. The senate majority, however, are determined to stick to the original plan, despite any inequalities which may be embodied therein and without regard to any effect it may have upon the industry as a whole.

Recent quotations on the Philadelphia market are as follows:

Southern Single Skeins.

4s to 8s	18	16s	20½
10s	18½@19	20s	21
12s	19 @19½	26s	22½
14s	20	30s	23½@24

Southern Two-Ply Skeins.

8s	18 @18½	24s	23
10s	19	26s	23½
12s	19½	30s	24
14s	20	40s	29½@30
16s	20 @20½	50s	38
20s	22	60s	47

Carpet and Upholstery Yarn in Skeins.

9-4 slack	19 @19½	8-3-4 hard twist	17 @17½
8-4 slack	19½@20		

Southern Single Warps.

8s	18½	20s	21
10s	19	24s	22½
12s	19½	26s	23
14s	20	30s	24
16s	20½	40s	29

Southern Two-Ply Warps.

8s	18½@19	24s	22½
10s	19 @19½	26s	23½
12s	19½@20	30s	24 @24½
14s	21	40s	30
16s	21½	50s	38
20s	22 @22½		

Two-Ply Combed Peeler Skeins.

20s	28 @28½	50s	42 @45
24s	30	60s	51 @53
30s	33	70s	60 @62
40s	38 @39	80s	70 @73

Single Combed Peeler Skeins.

20s	28	40s	37 @38
24s	29½@30	50s	43 @44
30s	32½@33	60s	51 @53

Southern Frame Spun Yarn on Cones.

8s	19	20s	22 @23
10s	19½@20½	22s	22½@23
12s	20 @21	24s	23 @23½
14s	20½@21½	26s	23½@24
16s	21 @22	30s	25 @25½
18s	21½@22½		

The *Charlotte Observer* in a recent issue prints the following editorial on "Cotton Corporation Ways" that is not only well worthy of reproduction, but should be carefully considered by everyone interested in the growth and manufacture of cotton:

"Arkansas has a "blue-sky" law under which a license to the Southern States Cotton Corporation of Macon, Ga., has just been forbidden in that state. This concern issues money to the grower on a warehouse receipt for his cotton, and promises to pay him 15 cents a pound. Its offer struck the officials of the Arkansas Farmers' Union as too good to be true. They accordingly had the Attorney General of the state look into the matter for them with reference to the possible expediency of invoking the "blue-sky" law. He reported some interesting things. It appears that the corporation's promise to pay 15 cents strikes him as from the standpoint of law only a promise to pay 15 cents if more than that much of the grower's own money comes into the corporation's own hands from the proceeds of the cotton pledged. None of the corporation's assets are behind any deficiency; on the contrary, the proceeds must bear all expenses, including the charge made by the corporation, as well as storage, freight, insurance, etc. The grower really takes the whole chance and receives no guarantee, whether sound or unsound. Hence a license to this concern is forbidden in Arkansas under the "blue-sky" law.

"We recite the facts, officially alleged, as for the benefit of Carolina cotton growers, and the more especially because neither state has a 'blue-sky' law. Farmers should keep in mind that not every one who comes saying 'Fifteen cents sure' or something like that is worthy of trust. He may himself believe or half-believe that he can do what he says; but this is a matter aside. There are several of these 'cotton corporations' operating in various parts of the cotton belt and we trust that farmers in this section will think not merely twice but twice times twice before they put any cotton or money into their hands."

COTTON MANUFACTURING.

DESIGNS FOR FANCY COTTON FABRICS.

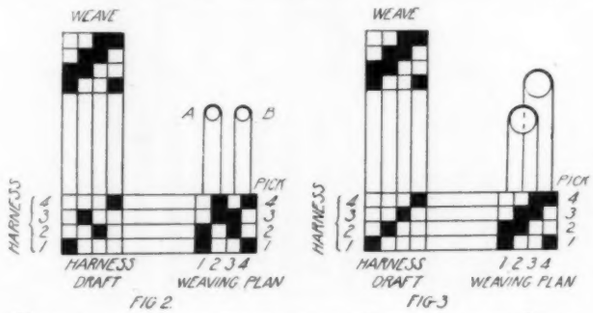
(*Contributed Exclusively to* COTTON).

BY THOMAS WOODHOUSE AND JAMES IRELAND.

PART TWO.

(In this series of articles the authors will not only describe the construction of cloth samples of their own providing and answer any questions concerning same submitted by the readers of COTTON, *but they will also be glad to analyze and describe the construction of any sample submitted by any reader which is giving trouble or on which he desires information. Answers to such questions will be published in connection with the regular chapters of the article, only the name of the questioner being withheld.—Editor.)*

The simple weave illustrated in Figs. 2 and 3, and variously termed common twill, serge twill, cassimere twill, shalloon twill, blanket twill, two up two down twill, and go ahead twill, but most elegantly represented graphically as shown by the symbol 2/2, may be used as the base, and also as the weaving plan, of much more elaborate patterns. By utilizing the four distinct orders of lifting as represented in these figures in their present order, in a reversed order and in selection and rearrangements of the various threads, it is possible to produce pleasing and effective patterns. Take for example Fig. 4, which is a photographical reproduction of a cotton fabric made specially to illustrate this point; all the threads in this pattern rise for two picks and fall for two picks, and there are only four different orders of movements, as will be seen by examining the design in Fig. 5. The complete



FIGS. 2 AND 3 ARE REPRODUCED HEREWITH FOR CONVENIENCE OF REFERENCE.

pattern occupies 96 threads and 4 picks as shown by the crosses. The two sets of solid marks immediately under the sections of the design (48 threads in each section) represent the order in which the threads are drawn through the 4 leaves of the harness.

Since in all these threads there are only four distinct kinds of movements, it follows that if we place, for example, the first thread of the design, which is raised for the first two picks and dropped for the third and fourth picks, on the first leaf of the harness, we may draw all the other threads in the pattern which weave in the same order on the same leaf, provided that we draw these threads on that leaf in the proper position in which they appear in the design. Thus, if we examine the design carefully we shall see that threads 1, 4, 9, 12, 17, 20, 25, 29, 33, 37, 41, 45, 74, 78, 82, 86, 90, and 94 are marked as being drawn through the mails or heddles of the first leaf of the harness. Similarly, the remaining threads of the design are placed respectively on the 2nd, 3rd, and 4th leaves according to the order in which they rise and fall.

By further reference to the weaving plan in Fig. 2, it will be found that the orders of lifting on these four leaves

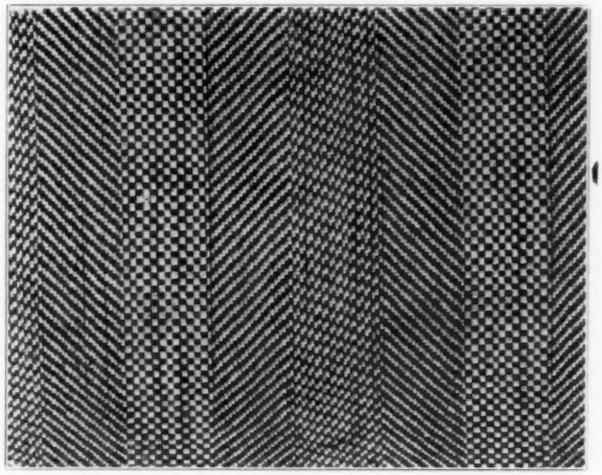


FIG. 4. A SAMPLE OF CLOTH SPECIALLY WOVEN TO ILLUSTRATE THE TEXT.

of the harness marked 1, 2, 3 and 4, are identical with those threads of the design in Fig. 5, which appear immediately above the solid marks on the 1st, 2nd, 3rd and 4th horizontal rows of small squares of the draft in Fig. 5. If it so happens that the power loom tappet is made or the dobby cards or lags cut or pegged according to the weaving plan in Fig. 3, it is still possible to reproduce the pat-

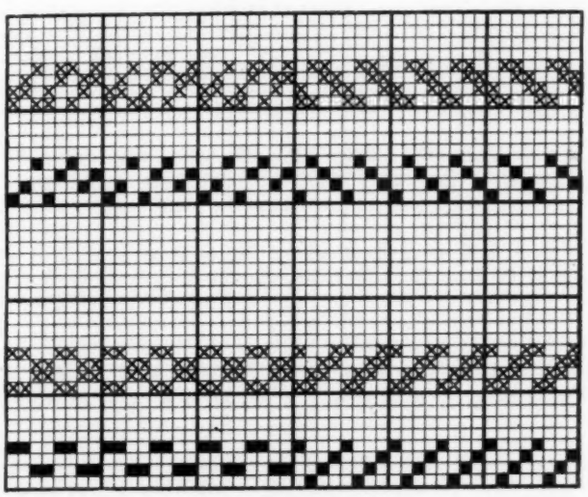


FIG. 5. THE DESIGN FOR FIG. 4.

tern illustrated in Fig. 4, but a change in the draft would be necessary. For an exercise the reader should make the new draft of the harness which would be necessary to use in conjunction with the weaving plan in Fig. 3 to reproduce the pattern illustrated in Fig. 4.

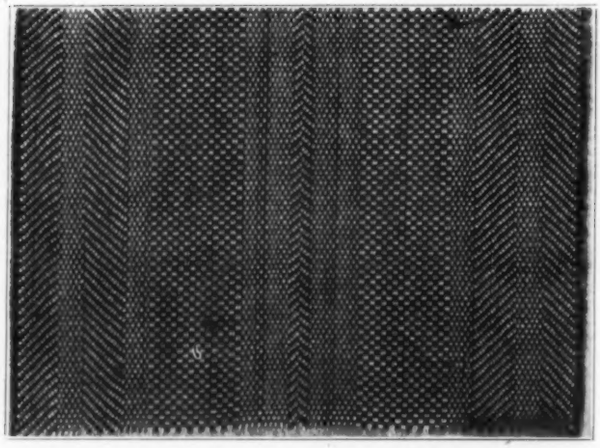


FIG. 6. A MODIFICATION OF THE EARLIER FABRIC.

By a simple modification of the lifting order of the threads, and of the number of threads, we have made Fig. 6, which is complete on 160 threads and 4 picks. The design and weaving plan is illustrated in Fig. 7, both parts being made by precisely the same methods as have been adopted in connection with Fig. 5, and the weaving plan in Fig. 2 is necessary with the draft given. Here again those interested may make a different draft so that the same pattern shown in Fig. 6 may be produced with a tappet made according to the weaving plan in Fig. 3.

The designs illustrated in Figs. 5 and 7 and the corresponding fabrics in Figs. 4 and 6 have been made mainly to indicate the possibility of introducing variety into the

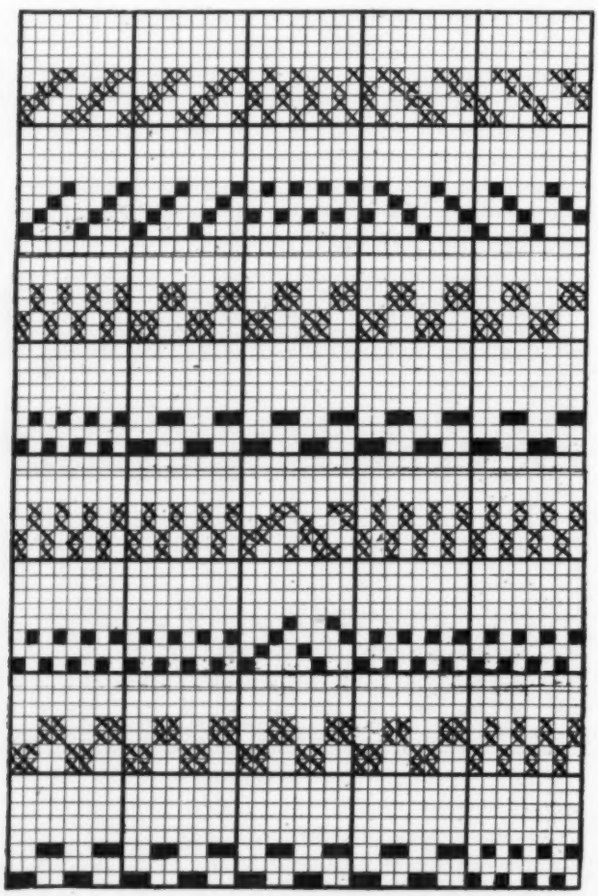


FIG. 7. THE DESIGN FOR FIG. 6.

patterns. It will be seen that in both cases, some of the leaves carry many more threads than others. In practice there are two methods of dealing with such cases; one is to cast out the superfluous heddles on those leaves which carry the least number of threads, and the other is to order leaves of different sets to suit the pattern. The method of casting out involves the use of a minimum number of sets of harnesses, but the other method enables the weaver to take up broken threads with less chance of error.

There are at least three distinct methods of ornamenting cotton fabrics to obtain effects of a striped or checked form, and all these methods may be utilized, not only in comparatively simple designs, but also in conjunction with the weaving of floral designs.

1. Where the stripes or checks are formed with warp and weft of the same color, with one weave only, but with threads and picks of different sizes—the thick threads and picks forming the divisions in both directions.

2. Where the stripes or checks are made with warp and weft of the same color and approximately of the same size, but where different weaves are used in the various parts of the pattern.

3. Where the stripes and checks are due to the effect produced by colored threads, one weave only being used.

Of all the methods of imparting ornament to the fabric, the one which appears to be the simplest is that of adding colored threads in the warp for longitudinal stripes only. More or less complicated weaving mechanism is necessary when the colored threads appear in the weft.

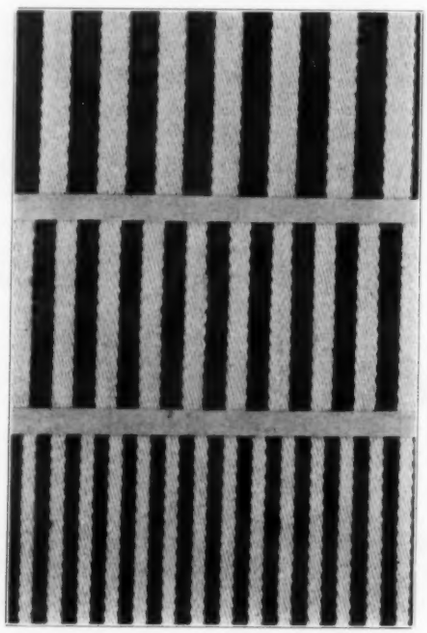


FIG. 8. SHOWING STRIPE EFFECT WHEN THE WARP THREADS PREDOMINATE ON THE FACE OF THE CLOTH.

The best and most distinct stripes in the warp are obtained by the use of sateen weaves and fine setts, and the simplest order of coloring is half of one color and half of another color. Nevertheless, considerable differences in effect result with half and half coloring. The broader the individual stripes are, the more prominent will be the result, and *vice versa*. This will be clearly seen by reference to three cloths reproduced photographically in Fig. 8. We mention this fact merely to indicate to those interested a method of emphasizing or of subduing any particular

section of a pattern. The distinct and unique nature of the stripes in Fig. 8 is due to the fact that the warp threads predominate largely on the surface of the cloth, and also to the fact that a large number of warp threads

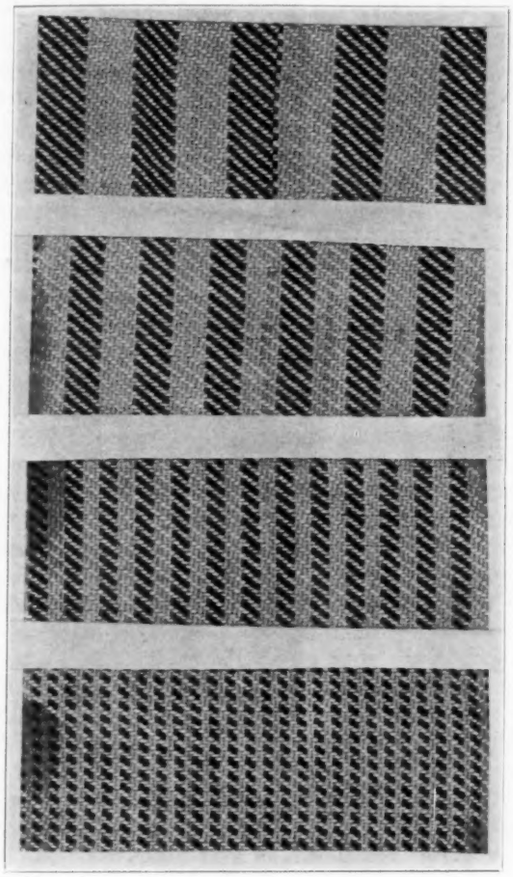


FIG. 9. WHERE THE WARP AND FILLING THREADS ARE ABOUT EQUALLY DIVIDED ON THE FACE OF THE FABRIC.

per inch are used in conjunction with a sateen weave; hence, although the filling is white, it has little or no effect upon the prominence of the dark stripes. When, however, the 2/2 twill is used and the number of threads per inch in the warp is practically the same as the number of picks in the filling, a much less pronounced effect results even in the wide stripes, while in the very narrow ones, say where the order of warping is two of one color and two of another, the stripe effect almost disappears. This will be seen clearly by referring to Fig. 9, which is a photographical reproduction of four separate patterns which have been woven specially to emphasize this feature.

It will be seen at a glance that the weave in this case is the 2/2 twill to left, and that it may be produced with a straight backward draft in the harness and a weaving plan identical with that in Fig. 2, or it may be obtained by drawing the harnesses straight draft forward as shown in Fig. 2, and using the 2/2 twill to left for the weaving plan would be the reverse of that in Fig. 3, that is, the order of the four vertical rows of small squares would be 4, 3, 2, 1.

There is just one other little point we should like to mention before passing on to more difficult work, and that is the possibility of increasing the prominence of the twill by observing the relation between the direction of the twill

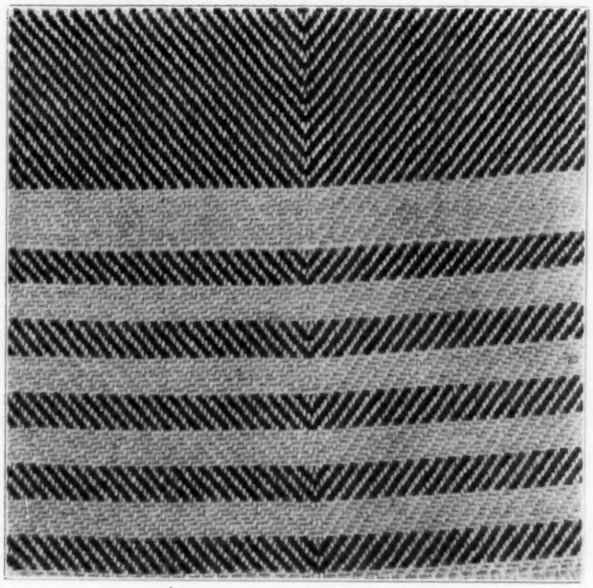


FIG. 10. SHOWING THE EFFECT OF TWIST IN THE YARN ON THE APPEARANCE OF THE FABRIC.

of the cloth and the direction of the twist on the yarn. Fig. 10 shows about 170 threads of white cotton wefted first with alternate bands of red and white weft, and then with all red weft. The warp as well as the weft is 2-fold twisted to right. The portion which is twilled to right appears more pronounced in character than that portion which is twilled to left. This is general when the twist of the yarn is in the same direction as the twill in the cloth, and hence a bolder twill results.

(To be Continued).

That cotton, measured in dollars and cents, is the most valuable agricultural product of the United States, with the single exception of corn, and that this country supplies approximately 75 per cent of the world's requirements of this staple, are facts that contrast strikingly with the statement made by Commercial Agent John M. Carson, of the Department of Commerce, that no commodity that enters into the domestic or foreign trade of any country is so carelessly prepared and so inadequately protected as American cotton. In his report on the packing and marketing of cotton, Mr. Carson further states that it is "the only important commodity which has resisted the spirit of progress and which continues to enter the market places in the form and garb of days prior to the Civil War."

The criticism is not new, and numerous efforts have been made to effect the much-needed change in the methods of handling cotton, but apparently with little success. Mr. Carson, who made an investigation of the subject under the direction of the Bureau of Foreign and Domestic Commerce, has set forth the factors contributing to present conditions and has also suggested a solution of the problem. His report, which has been issued as Special Agents Series No. 58, is a striking portrayal of the present wasteful methods, while the system he proposes for eliminating this loss will prove of much interest to all concerned in the cotton industry, from grower to manufacturer. The bulletin is illustrated with ten half-tone engravings. Copies may be obtained by application to the Bureau of Foreign and Domestic Commerce.

YARN SIZING AND SLASHING.

(*Contributed Exclusively to* COTTON).

BY FRED W. HORROCKS.

The purpose of sizing is to saturate and cover the yarn with a glutinous substance which will enable it to withstand the strain and friction of weaving. Formerly, local conditions had much to do with the question of what materials should be used. For instance, in India, rice flour was the principal substance in use, whilst in Europe, wheat flour was the basis. The progress of civilization, however, has produced changes, not only in the constitution of the size, but also, in many cases, in the object of sizing. Some classes of cloth made of low quality yarn and weft are made to appear full, and are certainly heavier and more saleable when sized with an admixture of clay to the flour, than when pure sized. To this end, the vegetable, animal, mineral, and chemical worlds have been ransacked, and our scientists are engaged in combining acids and alkalies with more substantial materials, so as to enable cloth to be sold at what the manufacturer considers a fair profit.

Ingredients for this purpose may be classed as follows:

1. Vegetable substances, with stiffening and strengthening qualities.
2. Animal substances, used to fix and soften the vegetable substances.
3. Minerals used to weight the warp.
4. Chemicals used to absorb and retain moisture. Chemicals, such as solutions of metals for weighting purposes. Chemicals to prevent fungus, or mildew in the cloth.

Pure sizing is required in the production of the best classes of cloth, made from the best American or Egyptian cotton. This size may consist of wheat flour, potato flour commonly called farina, rice flour, or sago; these being mixed with water. For a light size of ten per cent use a mixture of one gallon of water to one pound of flour. In the case of farina, one-tenth pound of paraffin wax to one pound of farina, but wax should not be used in the case of goods to be bleached or dyed, as it is not easily soluble. Dress goods should be bleached or dyed as quickly as possible after being woven, as the size seldom contains any antiseptic ingredients such as muriate or chloride of zinc.

The productions of Lancashire mills are mainly for export, only about one-quarter being required at home, so that, often, the time required for warehousing, shipping, and retaining is considerable, as are also the differences in climate. This compels the use of antiseptics to prevent mildew, but these are only required for goods exported in the gray state.

For medium sizing, say 50 per cent, use half as much clay as flour. When china clay or any other weight substances are used, tallow, wax and soap are required to prevent the other ingredients making the yarn too stiff; whilst blue is used to keep the yarn a good color. Chloride of zinc acts as an antiseptic; chloride of magnesia as a deliquescent, to keep the yarn moist. A little soda is often used to prevent ironmoulds.

For heavy sizing of 100 per cent and upwards, we use as much clay as flour, and often more. The following are mixings for light, medium, and heavy sized yarns:

LIGHT.

Wheat flour	1,000 pounds
Tallow	60 pounds
Soap	40 pounds

MEDIUM.

Flour	1,000 pounds
Clay	500 pounds
Paraffin wax	5 pounds
Tallow	200 pounds
White soap	100 pounds
Soft soap	20 pounds

AN INDIAN MEDIUM.

Flour	1,000 pounds
Clay	500 pounds
Tallow	100 pounds
Soap	25 pounds
Gum arabic	25 pounds
Bees' wax	15 pounds

HEAVY.

Flour	1,000 pounds
Clay	1,200 pounds
Tallow	220 pounds
Magnesia	30 gallons
Zinc	15 gallons

These mixings are not guaranteed to be the best possible in every case, as much depends upon the climatic conditions around the mill; the quality of the flour; the capabilities of the machine; and the prejudices of the sizer. Some sizers could not do without some of the ingredients; others could not do with them. A soft yarn holds more size than a hard spun yarn. Farina for light sizing goes farther than sago, or anything else. Sago gives better results than farina; the yarn is not so harsh or rough with sago as with farina, but sago is more costly. Chloride of magnesia is purer in the crystal than in the liquid. Cocoanut oil has been found to give off a bad smell when used in sizing.

The percentage of size on yarn does not depend solely upon the proportion of the various ingredients to one another, but requires also certain arrangements in the sizing machine. To increase the proportion of size: Reduce the speed of the machine; reduce the steam in the cylinders; reduce the weight on the press roller; put extra flannel on the press roller; and lower the immersion roller. To put on less size: Reverse these conditions; add water, and boil the size more.

Trade between the United States and the Orient in 1912 was the largest ever recorded. This is true both as to imports and exports. The imports from Asia and Oceania combined were, according to a compilation just completed by the statistical division of the Bureau of Foreign and Domestic Commerce, 280 million dollars in 1912, against 160 million in 1902; and the exports to Asia and Oceania, 190 million dollars in 1912, against 96 million in 1902, a decade ago. Thus imports from the Orient, if we include all of Asia and all of Oceania under that general title, show an increase of 75 per cent in 10 years, and exports thereto an increase of 100 per cent in the same period. Even the phenomenally large exports of 1905, when the requirements of Northern Asia, due to the Russo-Japanese war, brought our exports to Asia and Oceania up to the unusual total of 168 million dollars, are surpassed by the total of 190 million in 1912, the highest record of exports to the Orient which our foreign trade has ever shown. The growth over 1911 is about 20 million dollars as to exports and about 30 million as to imports.

KNITTING.

A SMALL MERCERIZING EQUIPMENT FOR A KNIT GOODS MILL.

(*Contributed Exclusively to* COTTON).

BY J. MERRITT MATTHEWS, PH. D.

Mercerized cotton yarn is now used to such a large extent by the manufacturers of knit goods that in many cases it would be a paying proposition for such a mill to do their own mercerizing. At the outset it may be said that the process of mercerizing is now standardized to such an extent that the manufacturer need not fear that he will have to acquire a complicated and more or less secret method of conducting the operations. When installed under proper expert advice the process can be so regulated as to be run in connection with the bleaching department of the mill, and with very little increased cost for labor or materials and without the necessity for a high-priced superintendent of a special mercerizing department. A capable superintendent of bleaching can readily be instructed in the necessary essentials for properly conducting the mercerizing operations. Furthermore, the amount of floor space required is not very great, and the installation of machinery for carrying out all the processes of boiling-out, mercerizing and drying is comparatively simple.

The mercerizing of cotton yarns for knit-goods involves the following considerations:

First.—Selection of the proper yarn as to stock, spinning, and twist.

Second.—The boiling-out or preliminary treatment of the yarn previous to mercerizing.

Third.—The mercerizing of the yarn, which involves a treatment under tension with caustic soda solution in proper machines.

Fourth.—The after-treatment of the mercerized yarn, which involves processes of washing, souring and softening, and possibly bleaching and scrooping.

Fifth.—The drying of the yarn.

It always goes without saying that the better the stock with respect to length of staple and silkiness of fiber, the higher will be the quality of the mercerized product. It was formerly considered that only the long-stapled and high-priced Sea Island and Egyptian cottons could be mercerized with sufficient satisfaction to warrant the expense of the lustering operations; but in more recent times American practice has found it possible to mercerize with good results even the ordinary grades of peeler cotton, and in some cases even the lower grades of carded cotton yarns are mercerized and given a degree of finish adding sufficiently to their commercial value to warrant the cost of the mercerizing process.

In the selection of the character of the yarn, therefore, the ultimate quality of the fabric desired must be a guiding principle, and the price to be paid for the yarn must of course be based thereon. Sea Island yarns will furnish a product of the highest quality and also of the highest cost; next in line come the Egyptian cottons. These take a high silky luster in mercerizing and give a soft, even yarn. The long-stapled and fine grades of American peeler cottons can be mercerized with eminent satisfaction, however, and are extensively used in the more moderately priced garments. Yarns made from Allan Seed Mississippi stock, or similar varieties, are especially suited for mercerizing yarns, and are eagerly sought for this purpose. The coarser and shorter-stapled stocks, it is natural to expect, will give inferior mercerizing effects, especially when the yarns are carded instead of combed.

Combed yarns, of course, furnish a better mercerized product than carded yarns. This is due to the fact that the fibers have been paralleled in the combing operation and thus placed in a position where they may more readily be placed under even and high tension which is so desirable a factor in proper mercerizing. With carded yarns, on the other hand, the fibers lie in all manner of directions, and the ends more or less project from the surface of the yarn, consequently the individual fibers cannot be placed under a very uniform tension, and as luster will not be developed, except where the fiber is in tension, it is easy to understand that the general luster of a carded yarn will be less than that of a combed yarn by reason of the loose fiber ends of the former yarn.

The final quality of a mercerized yarn probably depends more on the perfection with which it is spun than on any other factor. It is a great mistake to suppose that the mercerizing process can give a high finish to a poorly made yarn. The old saying that one cannot make a silk purse out of a sow's ear is as applicable to this case as to any other. An evenly spun yarn is the *sine qua non* of good mercerizing.

As practically all of the mercerized yarn for knit goods is two-ply, it naturally follows that the character and degree of twist is also an important consideration. In this connection, it may be said that, in general, a reverse twist for the two-ply yarn will give somewhat better results in mercerizing. The difference, however, is so small that, in this country, at least both direct and reverse twist are used.

As to the degree of twist, it may be stated as a general rule that a loosely twisted yarn will show a higher luster than one which is tightly twisted on the two-ply. The degree of twist, however, is also conditioned by the necessary strength which is required of the yarn, and a too loosely twisted yarn will not possess the necessary cohesion to withstand slipping of the fiber from the high tension to which it is subjected. It is very difficult to lay down any general rule for the degree of twist to be employed for mercerizing yarns, as this will depend to such an extent on the quality of the yarn itself and its count, but it is safe to follow the general rule to make the twist as low as possibly consistent with a high tensile strength.

Since the present article considers only the equipment necessary for a relatively small mercerizing plant in which the material will be processed in the form of skeins, one very important feature to which special attention must be paid is the character and make-up of the skeins. It must be borne in mind that it is desirable to have the skeins so arranged that when put under tension every thread in the skein will be subjected to the same degree of stretch. It must also be borne in mind that when subjected to the mercerizing action of caustic soda the yarn contracts con-

siderably and has a tendency to become matted or felted together, which causes swift winding subsequently to be quite difficult. In order to avoid waste in swift winding and to cut down the cost of this operation as much as possible, the skein should be so made up as to wind off freely. Again, the skein for mercerizing should not be made too large, as under such a condition the different threads will be of uneven length and will undergo different degrees of tension, and furthermore the skein will be so thick that there is danger of uneven penetration by the caustic soda liquor, as well as uneven washing and finishing. Taking everything into consideration, it may be said that the skeins for mercerizing should be cross-wound with a slow traverse, should be of a bulk not to exceed 2 ounces in weight, the ends should be tied in with the hand, and there should be two bands looped through the skein in three loops. This will preserve the form of the skein during the several mercerizing operations and greatly aid in the swift winding afterwards.

Coming now to the operation of mercerizing itself, the first point to be considered is the proper preparation of the yarns before actually treating with the caustic soda solution. As is well known, the cotton fiber in the raw state is coated with a wax-like body which makes the gray cotton yarns highly repellent of water and various solutions. This waxy substance is easily emulsified and removed when the cotton is treated with hot solutions of alkalies; and it might be thought that when treated with the strong soda soluion necessary for mercerizing the cotton, wax would be removed simultaneously with the action of the caustic soda in mercerizing and that consequently a previous boiling-out of the cotton would be unnecessary. The action of the caustic soda in mercerizing, however, takes place in the cold and is only for a very short duration, consequently, in order to obtain a quick and even penetration of the fiber, it is necessary to have the fibers highly absorbent before it goes into the cold caustic soda solution.

There are several methods of wetting-out or "boiling-out" cotton yarn for mercerizing. The simplest one is to work the cotton in a boiling bath containing about 3 to 5 per cent of soda ash. Or a bath of dilute caustic soda (1 to 2 degrees Twaddel) prepared from the waste wash liquor from the mercerizing may be used. The yarn is generally headed up in bundles, is packed into a wooden tank and gently boiled over night, being weighted down with a slatted cover in order to keep the material under the liquor. After this boiling-out the yarn is well washed and after the skeins are shaken out they are ready for mercerizing. The objection is sometimes made that when yarn is boiled-out with alkalies it acquires a harsh feel; therefore other methods of boiling-out have been undertaken. A very good method is to boil the yarn in water containing a small amount of Turkey-red oil. One quart of the oil per 100 gallons of water is ample to start with, and for successive lots in the same bath it is only necessary to make the addition of one pint of oil each time. Turkey-red oil has the property of rapidly dissolving the wax from the cotton fiber making the yarn in this way easily melted by solutions subsequently, and at the same time the action of the oil tends to soften the fiber instead of hardening it.

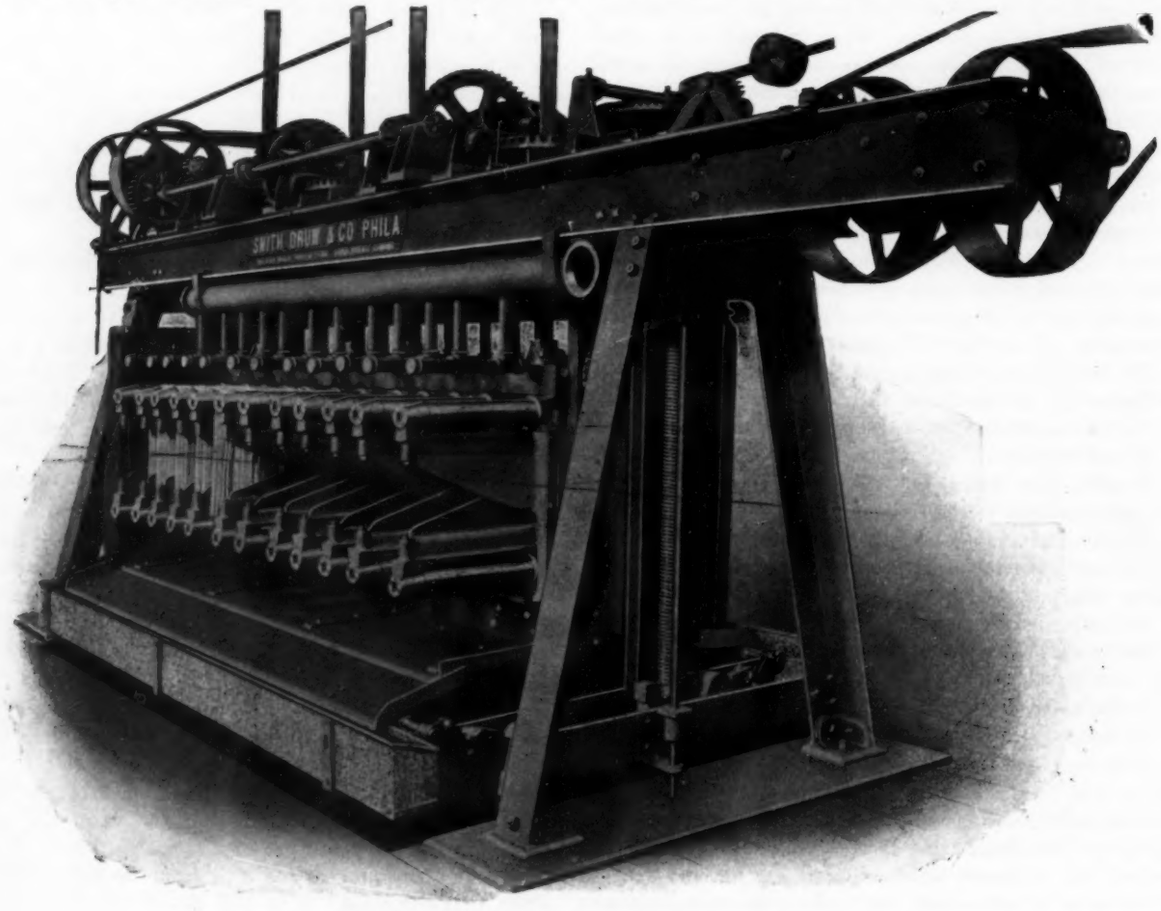


FIG. 1. AN AMERICAN TYPE OF YARN MERCERIZING MACHINE.

Another method of preparing the yarn is to steep it over night in a solution containing a dilute infusion of malt together with some alkali. The malt infusion brings about a sort of fermentation (or rather enzymic action) which renders the waxy and pectinous matters on the fiber soluble, thus making it absorbent. This malting process also leaves the yarn quite soft and lofty. Somewhat the same idea is carried out when the yarn is passed through a weak solution of soda ash, squeezed, and then laid out over night in the moist condition. Under these conditions a mild fermentation is engendered which solubilizes the pectin and waxy substances on the fiber without hardening the yarn as when boiled in alkalies.

Boiling out the yarn in pressure kiers as is practised in the case of bleaching, is not necessary for mercerizing, and in fact is generally avoided, as it is said to render the fiber harsher than when open kiers are used. It must be borne in mind that the only real object to be attained in the boiling-out of yarn for mercerizing is to make the fiber fairly well absorbent, whereas in the case of bleaching, the object of the boiling-out is not only to make the material absorbent but also to remove as far as possible all the non-cellulosic constituents of the fiber in order that a good bleached white color may eventually be obtained.

After the proper preparation of the yarn the next step is the mercerizing process itself. This consists essentially of treating the skeins of yarn while in a state of tension with a strong cold solution of caustic soda. The strength of this latter solution is usually 50 to 55 degrees Twaddel. No greater increase of luster is obtained by employing a stronger solution, and on the other hand the consumption and waste of caustic soda will be much increased. If the strength of the liquor falls below 45 degrees Twaddel the luster will show a loss. The temperature of the mercerizing liquor should be maintained at about 60 degrees Fahrenheit or lower. It was once thought that superior mercerizing or luster could be produced by using a liquor cooled to about 30 to 40 degrees Fahrenheit. This required, however, artificial refrigeration with ice or other means, and was rather costly; and it has been proven that whereas at the low temperatures a weaker solution of caustic could be used to produce a given degree of luster, yet the same luster can be obtained with stronger solutions at a higher temperature. Taking all things into consideration, the maximum luster can be produced with caustic soda of 55 degrees Twaddel at 60 to 70 degrees Fahrenheit, and consequently at the present time expensive refrigeration plants in connection with mercerizing are no longer employed.

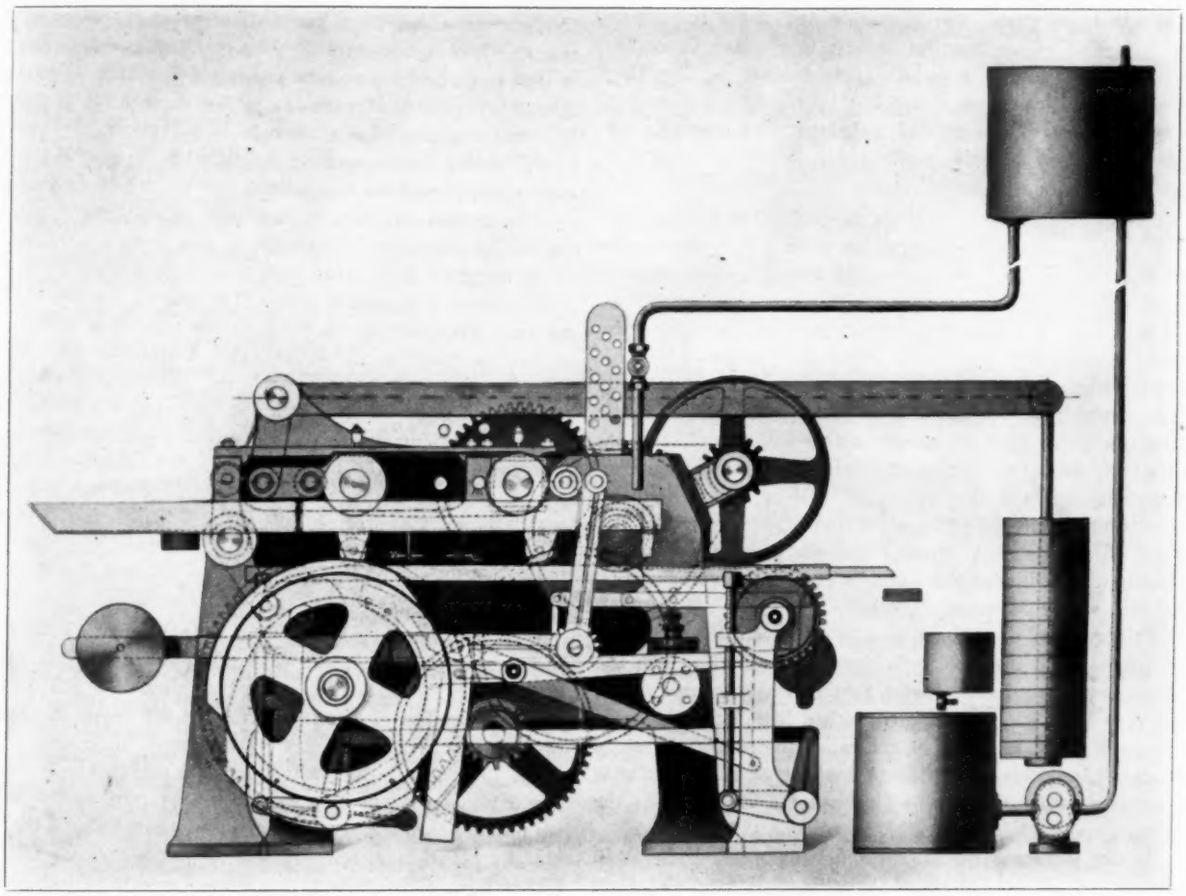


FIG. 2. A MERCERIZING MACHINE OF GERMAN MAKE.

Owing to the fact, however, that in the action of caustic soda in cotton, a considerable amount of heat is generated, the caustic liquors will gradually become heated up beyond a desirable limit unless a certain degree of cooling is introduced. This is now generally accomplished by circulating the caustic liquor through a coil of pipe immersed in running cold water. The water used for this purpose is generally that subsequently employed for washing the mercerized yarn, so there is no useless waste in this respect.

The tension on the yarn in mercerizing must be intro-

duced while the cotton is saturated with the caustic liquor, and is generally put on simultaneously with the introduction of the yarn into the bath of caustic soda. When cotton yarn is treated with strong caustic soda liquors it contracts in length to a considerable degree. The amount of contraction varies with the strength of the caustic liquor, but with the strength of solution employed for mercerizing, which is also intended to give the maximum shrinkage; the amount is about 25 per cent. The object of the tension employed in mercerizing is simply to prevent this contraction of the yarn, and consequently the amount of tension used for any class of yarn must be such as to leave the mercerized yarn of the same length as the untreated yarn. The development of the luster on the yarn is a result of this prevention of contraction. In consequence of the action of the caustic soda the fiber swells up from a flattened ribbon to a cylindrical form, and if maintained under tension so that longitudinal contraction cannot take place in consequence of the lateral expansion, the surface of the fiber is made smooth and lustrous. The ridges on the fiber left in consequence of the twisted nature of the original raw fiber also aid in increasing the luster by acting as a diffracting surface on the reflected light.

The application of tension in mercerizing brings us to a consideration of the machinery employed. For skein mercerizing the essential mechanical features are as follows: (1) A set of iron rolls between which the yarn is stretched; (2) a system of rotating these rolls so that the skeins are turned that every part may come in contact with the caustic soda solution and receive equal treatment; (3) an arrangement whereby the sets of rolls are moved so as to bring the skeins into the caustic soda solution and then remove them again; or on the other hand, an arrangement for so moving the tank containing the caustic liquor that the same result is effected; (4) a method of squeezing out the excess of caustic liquor from the skeins; (5) a method of washing the still stretched skeins first with warm water, and then with cold water.

This cycle of operations usually completes the mercerizing process and the tension is then taken off the yarn, the skeins are removed and given a further washing with water, and then with water acidulated with a little sulphuric acid (or acetic acid) in order to neutralize the small residue of caustic soda left in the fiber. A soaping or treatment with a softener is then given to give a soft, silky feel to the yarn.

In the selection of the machine for mercerizing skein yarns, there are several types available. An American form of machine which has proved to be very successful in this country is that made by Smith, Drum & Company, Philadelphia. This machine is shown in Fig. 1. It consists essentially of a set of vertically placed rollers over which the skeins are placed. The lower set of rollers are movable up and down, and in this manner a suitable tension can be placed on the yarn. The degree of this tension is regulated by a hand wheel. After the tension is placed on the skeins the yarn is moved around by the rotation of the upper set of rollers, the lower set acting as idlers. The whole set of rollers with the load of yarn is then lowered into a tank containing the caustic soda solution and located immediately beneath the machine. The skeins are allowed to run in the mercerized liquor for 3 to 5 minutes. The yarn is then brought up out of the liquor and allowed to run on the rollers for several minutes to squeeze out the excess of caustic soda, which runs back into the tank. An apron pan is then lowered at the side, and the mercerized skeins are given a washing with water from the spurt pipes located above the top set of rollers. The waste is carried off by the apron pan with a suitable duct at the side. After the washing is completed the lower set of rollers are raised somewhat, which takes the tension off the yarn and thus allows of the skeins being removed.

There are a number of skein mercerizing machines made in Germany, as this method of mercerizing yarn is largely practiced in that country, where numbers of small knit goods and other cotton mills do their own mercerizing. One of the best known of the German machines is that of Hohn, made by the Niederlahnsteiner Maschinenfabrik. This machine is especially adapted to the processing of comparatively small amounts of yarn. The general scheme of the machine is shown in Fig. 2. It consists of two horizontally placed sets of heavy rollers at each side of the apparatus. About two pounds of yarn are placed on each set of rollers. The entire action of the machine is automatic, the various operations of the cycle being controlled by cams. When the skeins are placed on the rollers, one set which is movable in a horizontal direction, moves back automatically, placing tension on the yarn; the amount of this tension is regulated by a weighted lever arm, and the weights may be varied for different qualities of yarn. The rollers are continually rotating, thus moving the yarn all the time it is being mercerized or washed. A sliding pan containing the caustic soda solution is located beneath the rollers, and when the tension is placed on the yarn, the pan rises up so that the lower half of the skeins are immersed in the caustic liquor. The yarn runs in the liquor for about 3 minutes, then the pan is lowered and squeeze rolls press out the excess of caustic liquor which drips back into the pan. The pan then slides forward so that a second pan is brought under the skeins, warm water from suitably arranged spurt pipes is then sprayed on the yarn, the waste water falling into the pan beneath and being led off to suitable drains, either for recovery or to waste. A cold water wash is then given, after which the tension on the yarn is relieved and the operator takes the yarn off the rolls which are now back in their first position and ready to receive another load of yarn. The caustic liquor is kept in a continual process of circulation by means of a small rotary pump, and is cooled by passing through a coil in a tank situated above the machine. Small additions of strong liquor are continually added from a reservoir to keep the mercerizing liquor at a constant strength. The entire cycle of operations on this machine takes about 9 minutes, and all the operator has to do is to put on and take off the skeins, all the rest of the operations being automatically controlled by the machine itself. In this way every batch of yarn gets exactly the same treatment and very uniform results are obtained.

It requires about ½ pound of caustic soda to mercerize 1 pound of cotton yarn in a skein machine; this is equivalent to a cost of about 1½ cents for caustic soda per pound of yarn. The cost for labor, etc., and other chemicals, such as acid and softeners, will be about 1½ cents more; so that a good estimate for cost of mercerizing skein yarn in a small mill will be about 3 cents per pound. There will be about ¾ per cent loss in weight on mercerized gray yarn, and if bleached the loss will be about ⅞ per cent.

DYEING, BLEACHING AND FINISHING.

PRINTING COTTON YARN.

(*Contributed Exclusively to* COTTON).

BY RAFFAELE SANSONE.

Colored effects on cotton yarn were produced to some extent by the ancients, who employed several methods in the treatment of their goods which, although very primitive in principle, are still used in those parts where great developments in the treatment of yarn goods have not yet taken place. The oldest of these methods was of very simple application. Each hank of yarn was conveniently stretched on tables, or boards, and a covering of suitable material was placed in those portions where white or colored stripes were required. The yarn thus treated was then dyed for some time in a bath of indigo contained in a wooden vat, where the blue coloring matter only dyed the exposed portions of the yarn. After this treatment the goods were submitted to a thorough rinsing in cold, or luke-warm water, which removed the covering leaving, when the process was properly carried out, clear white stripes. By untying the unexposed portions at different times, and topping in cold baths of different natural colors, a certain number of effects could be produced, in which such colors as yellow, pale green, pale blue, etc., were used. Another similar process of treating yarn goods, that found some application especially in Oriental countries, consisted in covering the yarn in the required spots with a resist made up of resinous substances having a low melting point, or waxes. In order to make these to adhere better to the goods, they were fused and then applied. When the resist had dried completely the yarn was dyed in the same way as shown above and the resist moved by hot water. A much more important method, which found later a certain application, was that of block printing. The treatment of the yarn was in this case much more simple. An operative pressed on the stretched material a wooden block furnished on its lower surface with engraved lines. Before each printing operation the engraved portion was welted on a wooden pad, soaked with the paste containing the coloring matter suitably thickened, from which it took up the necessary quantity of the same to give a clear stripe on the yarn. With a series of blocks, and a convenient disposition in the distance between each engraved line, several colors could be printed simultaneously in a very short time.

Very little change was introduced in the above methods till the last half of the past century, when a wider field was opened to this class of goods. During this period, so remarkable for the great transformations introduced in all branches of the cotton industry, yarn printing made considerable progress, and when the artificial coloring matters were introduced, they soon replaced the older natural products, permitting the production of a greater variety of shades than was formerly possible. The mechanical applications which followed closely the new coloring matters soon improved the older methods of treating the yarn, and when during the last decade the first yarn printing machines were constructed, yarn printing assumed a much greater application. These machines can be considered as a mechanical transformation of the older block printing process, in which the block, once worked by hand, is released by a sort of printing shaft that revolves on the yarn. In the machine constructed by a German manufacturer, which can be seen in the illustration, Fig. 1, this shaft is furnished with a series of closely fitting discs. These discs can be made of any required thickness. Between each disc a certain number of diaphragms are placed, which serve to regulate the distance of each printing surface, also giving the necessary rigidity. Underneath this upper printing shaft are placed two smaller shafts that revolve in a long color box, Fig. 2, from which they take up the color paste necessary for the wetting of the discs before printing. Like the block, each printing shaft can be used for one color. This machine is supplied with three upper and six lower printing shafts, permitting the production of six different colored effects. The number of colors can, however, be easily increased, if required, by dividing the color boxes

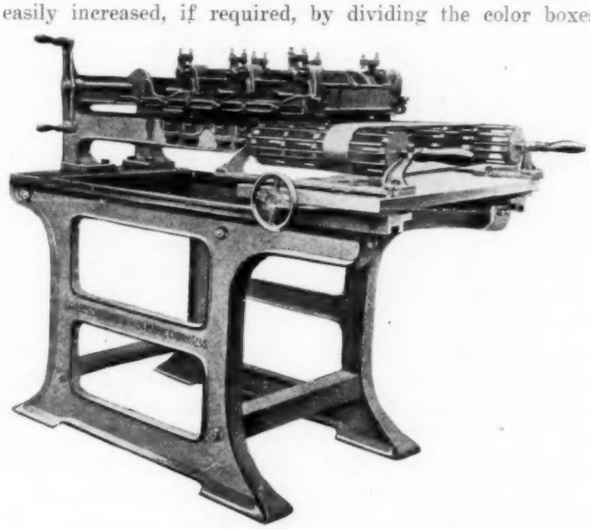


FIG. 1. THE YARN PRINTING MACHINE.

in their longitudinal sense. This is very seldom done, as the six colors meet most requirements. The color boxes and printing shafts are supported, as can be seen in the illustration, by four parallel arms fixed to the frame supporting the whole machine. The two upper arms that hold the printing shafts are furnished with a special disposition for raising or lowering the upper printing shafts, that is worked by the two handles seen on the left at the top of the machine. This permits the lowering for taking up the necessary color paste, and serves also for obtaining the required pressure between the upper shafts and the lower shafts when printing the yarn. The portion of the frame underlying these arms is furnished with a flat surface surmounted by a protruding rail on which a sort of movable iron platform, containing the shafts and bobbins supporting the stretched yarn, slides up and down the machine, being regulated by the small wheel seen in the middle of the figure. The said shafts are very irregularly arranged, and can be taken out at any time; the yarn being turned, when necessary, by means of the two wooden handles, seen on the front of the machine. This greatly facilitates the placing and taking off of the yarn, and keeps each hank in an even stretched condition.

The work of printing is comparatively simple. Both wooden handles, seen on the right of the figure, are lifted and the hanks of yarn are filed on, being spread on the wooden rods of the bobbins by subdividing each of the same, through its tyings, into lees. When a uniform surface has been obtained, the handles are replaced in their former bearings, which are so constructed as to keep up a regular tension on the yarn. The next operation is to arrange the disposition of the discs on the shafts. When this has been accomplished the place of each color paste has to be regulated; this is done by means of the discs, already mentioned, that are so placed on the lower shafts as to correspond with those on the upper shafts. Thus those taking up the blue color paste only come in contact with those that are to print on the yarn blue stripes, and the discs supplying other colors are so regulated as to take their respective places where required under the upper shafts. The color pastes are then placed in the color boxes, and the upper shafts lowered and revolved once or twice till they are

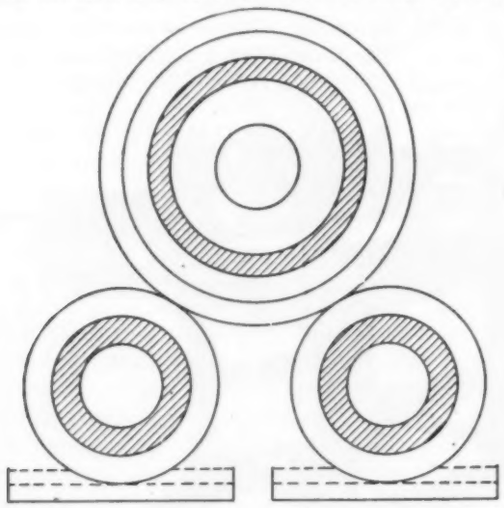


FIG. 2. A DETAIL SKETCH OF THE PRINTING SHAFTS.

covered equally all over. The platform supporting the stretched yarn is then pushed forward, and as the yarn comes in contact with the discs the colors are printed on its surface.

Only one-third of the yarn is, however, printed in this way, and the rest has to be treated as follows: The rows of the discs are slightly raised and the platform drawn out to its former position. By a turn of the handles supporting the stretched yarn, the next third of the unprinted yarn is exposed for the printing operation; care being taken to arrange the same so that the next stripes that are printed on the yarn come at the correct distance, or in the correct position; from those already printed. The discs are now wetted as before and the yarn sent through the machine, the same operation being repeated also with the remaining third of the unprinted yarn. In this way in three successive passages the whole hank can be equally printed all through. The working requires naturally some practice at the beginning; the difficulties can, however, be easily overcome by a neat worker. When many colors are to be printed simultaneously the placing of the discs requires a certain calculation, as each disc has to point on the yarn in a given position, and this is easily regulated by the diaphragms.

Yarn printing machines can be employed for the production of a very large number of colors to be used either for yarn goods, or woven effects. Two distinct groups are, however, distinguished: 1. That of the colors of little fastness and 2, that of the fast colors.

The first can be produced principally by direct printing, and for this purpose direct and basic colors are used. In the case of direct colors, a paste is made up containing the dyestuffs, sodium phosphate and gum tragacanth, or other suitable thickening.

A suitable proportion for this would be 40 parts coloring matter, 440 parts water, 500 parts gum tragacanth 6 per cent, and 20 parts sodium phosphate, making a total of a thousand parts.

After printing, the goods are dried, steamed one hour and washed. These colors are, however, very seldom employed for this purpose, while the basic colors find a somewhat superior application.

The following recipe can be used in this case: 5 to 10 parts basic dyestuff mixed with 185 to 150 parts acetic acid 6 degrees Be. (30 per cent), and 650 to 320 parts water, being dissolved warm. The solution is then filtered and the filtrate poured into a paste consisting of 130 to 260 parts tragacanth mucilage five per cent and 30 to 60 parts acetic tannic acid solution 50 per cent, making 1,000 parts. The goods are dried and steamed. If necessary they are fixed by passing them at 50 degrees C. in a bath containing: 10 grains tartar emetic dissolved in 1,000 grains of water, after which they are washed, soaped five minutes at 30 degrees C., rinsed and dried.

The group of the fast colors comprises a great number of processes which produce the following effects: (1) direct printing effects; (2) dyed or discharged effects; (3) "Changeant" effects; (4) "Ombre" effects, etc.

("Changeant:" A changeable effect; Indicates a dyed fabric that when observed in more than one direction appears as of two colors, a ground color and a superficial color.)

("Ombre:" Indicates a color that goes from the lightest to the darkest shade, forming as it were, a range of shades.)

The direct printing effects are those mostly used, as they are cheapest and require the least treatment. Sulphur, alizarine and other fast colors can be used for this purpose. A receipt for red could be proportioned as follows: 570 parts water, 50 parts wheat starch, 175 parts tragacanth 6 per cent, 75 parts acetic acid 30 per cent, 10 parts alizarine R X 40 per cent (M. L. B.), 20 parts alizarine 2 R G 40 per cent, 50 parts acetate of lime 15 degrees Tw., and 50 parts acetate of alumina 18 degrees Tw., making in all 1,000 parts. After printing on oil prepared yarn the goods are dried, steamed three quarters of an hour, soaped at 158 to 176 degrees F. with two parts neutral soap in one thousand parts of water, washed and dried.

A receipt for blue would be: 30 parts Pyrol blue, or other sulphur blue; 90 parts crystallized sodium sulphide; 30 parts calcined soda, and 564 parts water mixed together and added to 286 parts tragacanth mucilage 5 per cent, making 1,000 parts. Print, dry in the usual manner, steam one hour without pressure, mix, chrome and copper if necessary, rinse, soap ten minutes at 60 degrees C., wash and dry.

A receipt for black would be: 500 parts tragacanth 6 per cent, 94 parts aniline salt, 5 parts aniline oil, 25 parts chlorate of soda, 150 parts water, 50 parts yellow prussiate and 176 parts water, making in all 1,000 parts. Steam three minutes in the ager, then chrome, wash, soap if necessary, rinse and dry.

The dyed effects are sometimes used. They can be produced with direct, basic or any other dischargeable colors.

If the yarn has been dyed, for instance, in a direct color (a dischargable coloring matter), the dry goods are spread on the printing machine in the ordinary way, only that in the color boxes, in the place of the steam color, a discharge paste containing hyraldite, or hydrosulphite for white, and this substance and a suitable coloring matter if colored discharges are desired. After printing, the goods are dried, steamed, soaped, rinsed and again dried. In this way more colored effects can be obtained than with the ordinary direct printing process, as the ground color, by a suitable disposition of the discs, can be used as a stripe.

The "changeant" effects are amongst the most beautiful produced by this method of printing. Admitting that the machine is arranged for three colors, ground colors such as indigo, alizarine red and flavanthrene are first printed on the yarn, steamed, soaped, rinsed and dried. The yarn is then placed in the machine again, which is supplied in this case with such colors as rhodamine 6 G, methyl violet 6 B, and methylene blue B S. The pastes of the first are of normal constitution, while those of the second have to be sufficiently diluted so that only a very fine covering is taken up by the discs. Moreover, the thickness of the stripes must not be too small or the effect will be hardly visible. In this way very fine effects are produced, such as blue with pink reflection, red with violet reflection and yellow with greenish reflection.

The "ombre" effects are perhaps the most important as they permit the production of special woven effects, and if carried out on mercerized yarn resemble very closely to the same effects obtained on silk. These effects were once produced by a long, patient dyeing process, which required a great deal of skill and time; they can now, however, be produced by the yarn printing machine. For this purpose each shaft is furnished with a few discs of fairly fine surface, which are placed on the different shafts so as to start on the first at one extremity and finish on the last at the opposite side of the machine. In this way as the yarn passes through the machine it takes up from the first shaft a certain number of stripes of a pale color which is followed on the second by a slightly darker shade and so on through each shaft till in the last it assumes the darkest shade. If the yarn is desired with three "ombre" effects in the hank it is printed in the ordinary way. Should, however, only one "ombre" effect be wished all through the hank, the goods must be taken out after this printing and treated again twice on the same machine with the next shades required. The preparation of the color pastes is in this instance very simple. A suitable thickening is mixed carefully with the measured amount of the standard color paste, which in this case is prepared for the darkest point, in such a manner as to be of one uniform color all through. For the first shade, the most difficult to prepare, very little of the standard color is necessary, and this, after some practice, can be easily calculated. The following color pastes are then prepared in such a manner as to reach in the last print the standard coloring matter.

Amongst the numerous woven fancy goods the following can be conveniently produced with printed yarn: (1) cheap spotted goods; (2) woven fabrics with colored borders; (3) "changeant" woven effects.

The cheap spotted goods are produced when the warps, or wefts, are jointed in hank form before being placed on the beam, or in the shuttle, as the case may be. If the warps have been printed, after drying they are transformed from hanks into chains, and placed carefully on the beams, so that the stripes run straight through the width of the same. In this way on the loom straight designs of special appearance are produced. If a single colored weft is used only the printed portion of the warp will appear in the design and the ground will be constituted by the weft. An alteration in the construction of the cloth itself creates in this case a great variety of effects of more or less novelty. When, however, a printed weft is also used, the design becomes more complicated, and by altering the disposition of the warp threads numerous effects are produced. Here also can the colors printed play their important part, for if they are fast, a superior woven textile can be turned out at a comparatively cheap price, while if the colors are not fast, only poor goods are obtained that can only last a season, as during the washing the colors would run badly, staining the whites and lighter colors and destroying the whole beauty of the fabric. For these articles such colors as turkey red, para red, indigo, etc., should be used.

The production of printed borders is not so easy, as great accuracy is required in order to produce the best effects. In this way towels of great novelty can be produced very cheaply, it being only necessary to print a portion of the hank on the printing machine, and taking the precaution to place the printed yarn on the warp beams in such a manner as to have all designs in a parallel position. If a jointed weft be now inserted towards the ends of each towel a superior appearance can be given to the same.

The "changeant" woven effects can be considered as the most beautiful that can be produced on the loom. By a suitable disposition in the construction of the yarn the warp can be made to appear on the front of the cloth, and if it has been properly printed on mercerized yarn, after the goods have been woven, the brilliance can be further enhanced by a calendering, or schreinering and some of the finest silk goods imitated very closely.

SOME ADVANTAGES AND LIMITATIONS OF VAT DYES.

BY ELMER C. BERTOLET.

In the last few years decidedly more attention has been paid to production of colors on cotton that have greater fastness both to laundering and for color effect woven in the gray and bleached in the piece. Formerly the only colors that would withstand this treatment were the Alizarin colors on a Turkey red oil—chrome or oil-alum mordant such as Turkey red and Alizarin blue. The sulphur colors, due to their insolubility in water, supplied colors fast to boiling soap, although they were limited in range of color, being especially weak in bright violets and having no reds at all except thio-indigo red, which is a vat color that can be applied in a sodium sulphide dye-bath. The vat dyes combine the fastness of the sulphur colors with the added advantage of being fast to bleaching under proper conditions with chloride of lime. It is this factor, combined with the brightness of the vat dyes, that makes them an important addition to the dyestuff industry.

The military of the various governments, who ask the highest requirements attainable of colors, have demanded the use of the vat colors in their uniforms. Of course, there is no color absolutely fast to all requirements, and it is

*Extracts from a paper read before the Alumni Association of the Philadelphia Textile School.

common to have colors that withstand excellently a dozen tests and fall down on one which will prohibit its use for the highest fastness.

As in all other classes of dyes, we find that fastness of vat colors is only a comparative term. The best colors we can find for a purpose necessarily rank as 100 in our standard for comparison, and all others are judged in accordance. As in all classes of dyestuffs, there is great difference in fastness within the class. A bleachery, that handles large quantities of gray cloth with colored vat-dyed effect threads, makes a test of every different piece that enters the kier for boiling out previous to bleaching. While every bleachery has the same process of bleaching, it varies considerably in detail as to the time of boil, strength and assistants used in kier, chemicking, etc. Therefore the requirements vary as much as the fastness of the colors, and this is a point to be considered when we talk of fastness, which is a comparative term in itself. Caustic soda cannot be used as boiling out agent in the kier, as it causes the color to bleed.

The vat colors are insoluble in water, dilute alkalis and dilute acids. The fastness of a color toward any reagent is in the main dependent upon the insolubility of the color in the medium used for finishing, laundering or in the use of the fabric resulting. Vat dyes, like all the fast colors on cotton, i. e., sulphur, aniline black, para nitianiline red, pigment or mineral colors or the lakes of Alizarin colors with chrome, alum or metallic salts formed on the fiber, owe their fastness to washing or boiling soap to their insolubility in this reagent. The vat colors cannot combine with the textile fibers to this insolubility in water and must, therefore always contain a reducing agent capable of causing reduction of the dye to a leuco-base, soluble in dilute alkali, in which form it penetrates the fiber. When the alkali is neutralized or the reducing agent destroyed by atmospheric oxygen, or an oxidizing agent such as chrome or bleaching powder, the insoluble original color returns and is thus combined in the fiber. If the medium for our everyday washing in the home happened to be a hydrosulphite solution (reducing agent) in the presence of alkali, instead of water, the vat colors would not have been known because they would have had a historical career instead of one of usefulness. To most other reagents vat dyes hold up well, so that ordinary sensible requirements are satisfied.

It is in the application of the color to the fiber that great limitations are put upon the use of vat dyes, except for the finest work. The cost of application is likewise very great; first, because of the expense of the coloring matter, some of the powder brands costing $5 per pound. Of course, they are practically new colors, and it is a question of what difference a few years will make in improving methods of manufacture and competition in the market on the first cost of the color. The hydrosulphite and caustic soda are an added expense. Second, because of time consumed to completely finish a lot. The labor cost is great because color must be allowed to reduce, applied to fiber in the dye-bath for an hour, oxidized in air, washed and soaped thoroughly.

The vat colors typified by indigo have been known from ancient times. The vats used were fermentation vats where bran, madder and wood were used in presence of caustic alkali and allowed to ferment, and the hydrogen liberated in the nascent state by the fermentation acts as the reducing agent to make color soluble. Later the zinc-lime and copperas vat were used and was followed by sodium hydrosulphite (made from zinc dust and sodium bisulphite). The introduction of the stable hydrosulphite has brought more comfort for the dyer. The old vats were dirty, having a large amount of sediment which contained the reducing agent, required hours of patient watching to see that proper fermentation took place, and then could only be used intermittenly between dyeings and allowing to stand several hours after stirring up with more fermentable substances, indigo or alkali. They were harder to control, required more room in the dyehouse to produce a certain amount of work and caused a considerable loss of dyestuff in the sediment.

The stable hydrosulphite or that made from zinc dust and sodium bisulphite have no such disadvantages like the above to trouble the dyer. The vats reduce to clear solutions, as the hydrosulphite is soluble in dilute alkaline solution (and in fact made more stable by presence of alkali). This is a distinct advantage over the other forms of vats and, while the vat colors could be combined with indigo in any sort of a vat, they are not used except with hydrosulphite.

The vast number of colors to match patterns for so many different customers, who perhaps have no one stock color exactly alike, had led some dyers to put out a vat color card saying, "This is our range of colors which we guarantee as to fastness and to match perfectly. No inbetween shade or depth will be attempted." This is perhaps reasonable to expect when we consider how hard it is to get colors exactly matched. When the dyestuff is reduced, for instance, the indanthrene yellows reduce to blue solutions, the indigo colors, which give blue colors, reduce to orange or yellow, helindone yellow to blood red solution. When the color is oxidized and soaped the color of the yarn is different entirely from the shade demanded, and when we consider that varying amounts of caustic soda and hydrosulphite give varying results with the same recipe, we can see that vat colors require dyers of more experience than with ordinary colors. They must have a knowledge of what an excess or a deficiency of each ingredient in the making of the vat will do to each particular color. The mixing, for compound shades, of two or more colors requires careful attention so as to mix colors that have about the same degree of exhaustion at a given temperature. This is a problem in all classes of dyeing, but is a little more difficult with the vat dyes. The majority of the dyes put on the market are in a paste form, which, if they are allowed to stand exposed to air, lose water and thus concentrate themselves, and will thus cause the dyer to use a greater amount of dyestuff for certain amount of paste weighed out. This will cause the color to go over shade, and points to the advantage of the powder brands, even though they should be harder to reduce.

Throughout the country advantage is made of machine dyeing for lots of loose stock weighing as high as 1,000 to 1,200 pounds. The color is then mixed with other dyed stock or made up in the solid color, thus getting a perfectly even thread, which in ordinary dyeing, due to uneven squeezing or oxidation, would leave the yarn uneven.

While the limitations of the class are fixed, they are being applied in many lines of work. The dyeings obtained on cotton are fast to alkali, washing, cross-dyeing, boiling, water, weather and chlorine. For piece goods the dyeing is best done on a jigger provided with squeezing rolls and

arrangements for oxidizing. Light to medium shades are more easily dyed with advantage on a padding machine, where the production is much increased. The same methods used for indigo printing or discharge printing can be applied to vat colors. Mention might be made of the new hydrosulphites which are used for discharging vat colors. They reduce, in presence of alkali, the dyestuff which in this state is not oxidizable by atmospheric oxygen and can be readily washed off with water.

With all the limitations, the advantages gained by the use of the vat dyes greatly overbalance any trouble taken to produce first-class fabrics, and they have come to stay. We might say that they are just passing their infancy and, with the powerful laboratories of the great dyestuff industry engaged in research work, we can be assured of a much greater use at lower cost in the near future.

THE MANUFACTURE OF ARTIFICIAL SILK FROM COTTON.

(*Contributed Exclusively to* COTTON.)

BY H. R. CARTER.

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The filter press used to free both the pulped cotton from moisture in the first instance and the precipitate of cupric hydrate in the second place, consists of a succession of hollow and perforated cast iron frames over which cotton duck is stretched. These plates have all a large central hole, which, when the projecting edges of the frames are firmly pressed together, forms a pipe communicating with the space between the several frames. The pulp or precipitate and water of suspension are forced from the "montejus" into this pipe and enters the space between the frames, the water passing through the cotton duck and into the hollow frame, the pulp being left in the form of firm cakes between the faces of the frame. The water is allowed to run off from the hollow frames through a cock with which each is provided and the cake is removed by separating the frames, when it falls into a receptacle placed underneath.

The frames are provided with lugs at each side which rest and slide upon horizontal bars. They are pressed tightly by means of a coarse square threaded pressure screw. If a second washing of the precipitate is deemed necessary to get rid of glauber salts, etc., the cake must be broken up again in the hollander with water and the filtering process repeated.

The freeing of the precipitate from the bulk of the water is necessary in order to check the quantity of water which goes with it into the mixer. Although the cellulose dissolves more easily on the addition of ammonia if it is not bound up in hard lumps of precipitate, some experts prefer in order to have full control of the water to the mixer, to press the cakes of precipitate in a hydraulic press to completely free them of water. If the bulk be then weighed, variations above or below the normal may be taken to represent water which must be withheld or supplied afterward.

To press the cakes in a hydraulic press they must be wrapped up in cotton cloths. This pressing makes them so hard that they must be broken up and disintegrated in a machine similar to a sausage machine before they are put into the mixer. After the precipitate has been formed, the remaining operations must be quickly carried through, or the precipitate will be spoiled through excessive oxidation.

Fifty-five pounds of bleached cotton will under this process produce an average of 236 lbs. of hydraulically pressed blue cake, which when disintegrated as described is emptied into the mixer, 19 gallons of liquid ammonia (sp. gr, .880) being run in at the same time, both being mixed together by revolving agitators. If the cakes were hydraulically pressed it is advisable to add a sufficient weight of water to bring its weight up to the maximum weight of pressed cake so that a uniform solution may be obtained.

If the operations have been conducted as described and

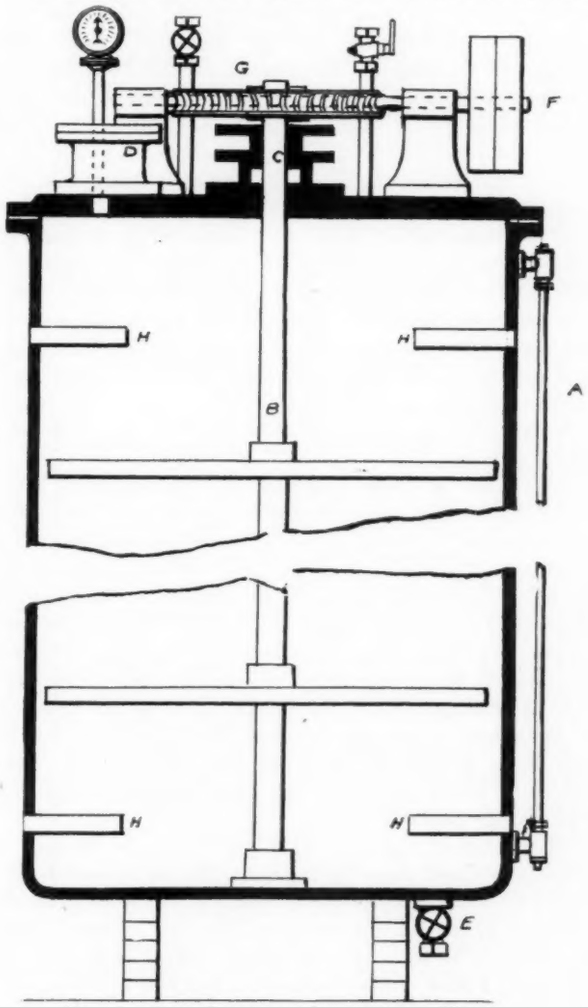


FIG. 8. ONE STYLE OF AGITATOR OR MIXER.

the pressed cake is sometimes heavier and sometimes lighter than the average, it is because more or less water has been left in the cake. When, however, the cake is passed to the mixer direct from the filter press in its moist state, it is unnecessary to add any water and indeed it mixes in with the ammonia better and dissolves more easily in this state, since it contains no hard lumps.

After three days and nights of continuous stirring, 1½ gallons of liquid caustic soda at 70 degrees Tw. are pumped into the center of the gelatinous mass through a pipe specially provided in the side of the mixer, a like quantity of water being added in a similar fashion if pressed cake was used. Otherwise the addition of water at this stage should be unnecessary unless the solution should be found

to be particularly viscid. In a similar manner two gallons of water more may or may not be added upon the fourth day, stirring being kept up all the time. It is particularly essential that no interruption of stirring should take place during the first few hours after mixing or while the caustic soda or water are being pumped in.

The stirring shaft B, Fig. 8, of the mixer, passes through a stuffing box and gland C, which must render the passage of air impossible. The hand hole D through which the ingredients are fed into the mixer is also hermetically closed, by a rubber ring gasket and bolts, and as soon as the mixer is charged. The whole cover and any cocks and pipe insertions which it may carry, as well as cocks and joints everywhere must be perfectly air tight, else the evaporation of ammonia and the admission of air will change the viscosity of the solution as will also the surrounding temperature which must be kept uniform and with advantage as low as possible for the cellulose enters more readily into solution at low temperatures. For this reason, the mixers may be jacketed, packed with ice and the whole covered with a non-conducting composition.

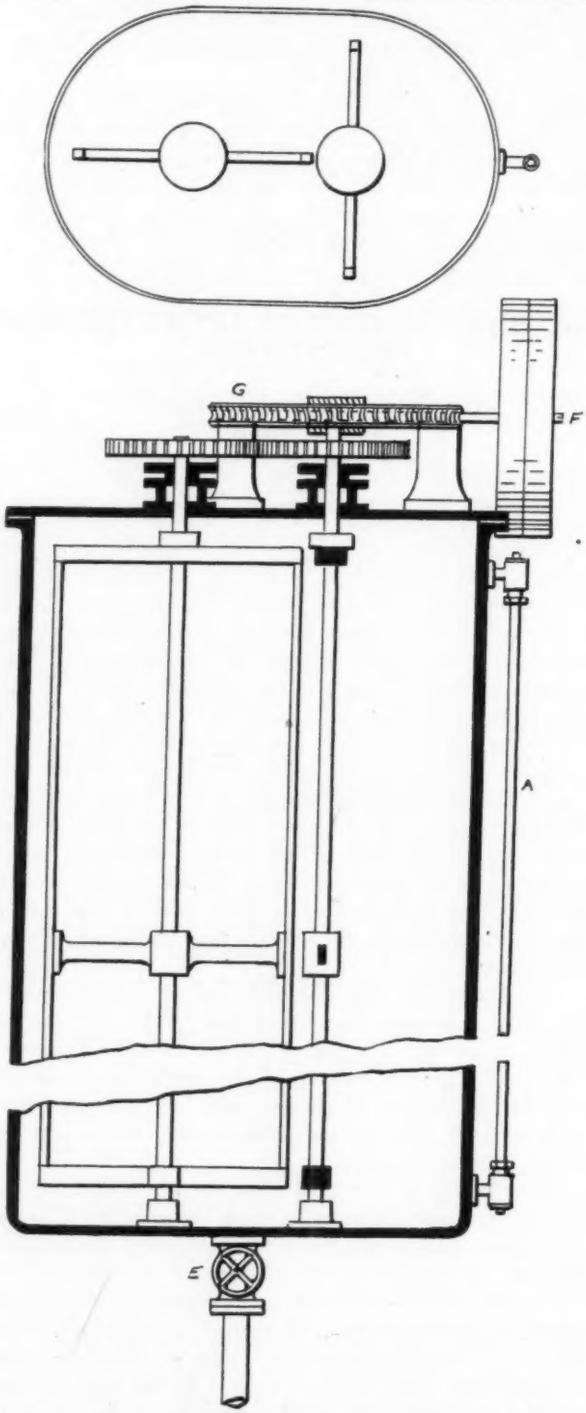
The process of solution may be watched by extracting, with a ladle, a small quantity of the solution, squeezing it between two smooth and clean glass discs, which when held up to the light, will show fiber as yet undissolved if such exist. The finer the disintegration of the cellulose itself and the cupric cake afterwards, the more quickly will complete dissolution take place since the reagent then comes more quickly into immediate contact with every particle of the cellulose.

The form of mixer generally used consists of a horizontal or vertical cylinder preferably of cast iron. Its capacity may conveniently be of about 45 gallons. The quantities of solution ingredients just mentioned will readily fill it, the additional space being required as the mixture swells as the cellulose dissolves. If the mixer is vertical as shown in Figs. 8 and 9, it must be supported upon an iron framework or upon legs, leaving room for the connection of a flanged cast iron cock E, to a flanged opening at the bottom of the cylinder, and for the addition to the cock of a bend of 4-inch pipe. The lid should be permanently bolted on, the joint being hermetically sealed with rubber packing.

The vertical agitator shaft which passes through a stuffing box and gland in the center of the lid and is operated by a worm upon a short shaft F carried in brackets attached to the lid, the worm gearing into a worm wheel G, which is keyed upon the vertical shaft. This shaft is turned at a slow rate by means of a belt and a pulley upon the worm shaft. As a considerable amount of power is required to drive the stirring shaft, especially immediately after the vessel is charged, the driving belt should be of ample width and the worm wheel of large diameter to avoid heating up and causing undue friction and wear. With the same object in view, the worm should be run in an oil bath and a circular oil catcher or pan should be placed around the worm wheel so that there may be no possibility of the oil finding its way into the interior of the mixer.

The lid of the vessel should also carry a pressure gage and cocks for attachment to vacuum and pressure air pipes overhead. There must also be a small man hole or hand hole, D, Fig. 8, at least six inches in diameter in the lid for the introduction of the ingredients, this hole being provided with a lid or cover which may be rapidly clamped down and hermetically sealed when the charge has been made.

The agitator may have arms extending radially from the central shaft as seen in Fig. 8, or they may be of the form shown in Figs. 9 and 10, which show the sectional and plan views of the mixer. In the former case the arms



FIGS. 9 AND 10. PLAN AND ELEVATION OF ANOTHER STYLE OF MIXER.

may be wedge shaped and similarly shaped projections H, may be fixed in the interior of the vessel between the radial arms to increase the stirring effect. The plan view of the mixer shown in Fig. 10 gives the relative position of the two agitators in that style of mixer.

When the caustic soda liquor or water is added to the solution in the mixer, it must be pumped into the center of the viscid mass. To provide for its introduction, a cock is screwed into the side of the mixer about a foot from the bottom, the cock being connected by a pipe with a force pump which draws the liquor to be injected from a bucket and forces it into the interior of the mixer against the weight of its contents. In order to distribute the injection as much as possible, a perforated tube may advantageously be temporarily inserted into the interior of the mixer when required.

When ammoniacal hydrate of copper (Schweitzer's solution) prepared as already described, is used as a solvent for the bleached cotton or cellulose, similar mixers are used. The solvent is first run into the mixer from the measuring tank and then a small quantity of caustic soda solution added and the two well mixed together before the cotton is thrown in—16 lbs. of cotton for each 22 gallons of solution.

If the cotton has been properly bleached it should dissolve completely and be spinable after having been stirred for seven hours. Cupro-ammoniacal solution of cellulose prepared by the former method is usually "pressed over" through a filter into a storage tank constructed with stirring gear on similar lines to the mixers but of about 200 gallons capacity. The filter connected up in the line of piping between the base of the mixer and the storage vessel, consists of a succession of cast iron frames over which a metallic wire gauze is stretched. These frames, each containing two gages are firmly pressed together so as to form an air tight box into which the solution enters through a cock and leaves by a pipe. The gauze wire used should become finer and finer, that is to say, finer gauze should be used in the second press than in the first and so on. This metallic gauze is usually classed by the number of meshes per inch, say 80, 100, 144 x 18 or 20, etc.

The filter should be opened up and cleaned twice a week or oftener if required. This operation consists in unscrewing the compression screw by means of the hand wheel so that the closing plate may be drawn back and then each frame separated permitting the gauze wire which covers them to be thoroughly cleaned with a brush or renewed when necessary. The gauze wire can only be torn by carelessness on the part of the man in charge, if he allows the solution to blow through completely and the compressed air to pass freely through the filter. In order that solution may not be blown through completely in pressing over, filtering, etc., it is advisable to have a glass tube or level gauge extending almost the whole height of the vessel in which the position of the surface of the solution may be seen. This tube is shown at A in Figs. 8 and 9.

A hood over the press and a duct connecting with a fan, draws off the vapor of ammonia while the press is being cleaned. The gauze wires should be passed through a flame before use to remove the impurities, grease, etc. The foul gauze from the press may be cleaned upon removal by washing in ammonia, then dried and passed through a flame.

In the Glanzstoff process, the solution is pressed over from the mixer into a reservoir from whence it passes through a filter into another reservoir, from which it is again forced through another filter into another reservoir and from there through a third filter into the spinning vessel. All this is accomplished by air under pressure which is admitted to the mixer from an air reservoir, into which an air pump is constantly forcing air. The air at a pressure of about 80 lbs. per square inch acts upon the surface of the viscid liquid and forces it through the pipes and filters.

The opening and shutting of the various cocks necessary to carry out the pressing over operation is of such importance that it should only be entrusted to a careful foreman. In order to help him, it is a good plan to paint the various pipes different colors.

The first two filters should be opened up and cleaned, the first every two days and the second every week. Once a fortnight will be sufficient for the third for when the solution is good and the first two filters are in good order, the gauze in the third remains quite clean.

It is found by those preparing the cupra-ammoniacal solution of cellulose after the Theile method, that the solution spins better after it has matured for several weeks in the storage vessel in which it is stirred under vacuum to remove air bubbles. Users of the Glanzstoff process, on the other hand, find that the solution decomposes and becomes more liquid if kept and believe that it produces better silk if spun within three days.

(To be Continued)

FINISHING COTTON GOODS CONTAINING SILK STRIPES.

(Contributed Exclusively to COTTON*)*

BY S. R. BALTA.

The bleaching and dyeing of these goods should form a separate branch in the textile industry, since the output and demand for this class of goods increases every year, while the successful working in the bleachery offers difficulties and obstacles peculiar to this class of goods alone. To emphasize the last statement it will be enough to give a few of the orders the dyer meets with in dyeing goods of this description.

Dye the silk lavender, the cotton tan; dye the silk brown, the cotton blue; dye the silk white, the cotton black; dye the silk black, the cotton white; etc.

As for the bleaching of these goods, although theoretically simple, they are in practice not less troublesome. The strength and lustre of the silk stripe must be considered and will give a lot of trouble if not handled carefully, but what is more annoying to the bleacher is the last but not the least difficulty to prevent the silk from acquiring a yellow color. This is the most common and most annoying occurrence in the bleaching of silk stripe goods, especially where the whiteness of the silk is of main importance, such as cases where the silk stripe is to be dyed a bright light shade of Helio or blue and where the slightest trace of yellow will dull the shade.

I cannot help mentioning a friend of mine, a bleacher, who used to meet every new lot of silk stripe goods with the following verse, singing to the tune of "On Our Golden Wedding Day."

"There comes silk and cotton"
"That surely will be rotten"
"And I won't have peace today."

This man was in the business for about eighteen years, his main work being cotton piece goods and although in his experience he had done a good bit of the silk stripe goods, and could overcome the damaging of the tensile strength and lustre of the silk, he was never sure whether the latter would come out white or yellow after bleaching.

To preserve the strength and lustre of the silk stripe is rather simple and easy. Only in one instance are these effected chemically, *e. g.*, in the boiling out. Caustic alkalies at a high temperature will injure both lustre and strength of the silk, but by using a good neutral soap both these difficulties are removed. To prevent the silk from acquiring a yellow color is a different matter and depends on different causes, so that there are more chances of getting bad results.

Imperfect scouring is one of the causes of the silk being of a yellowish color after bleaching. The sericin of the silk fiber is yellow and if properly removed will leave the silk practically white, if the deguming is not perfect, *e. g.*, only a part of the sericin removed, the silk will remain yellow even after bleaching with peroxide. The following illustration of the process of scouring the goods will explain how this fault may take place even with experienced bleachers. The majority of bleachers prefer to scour the silk stripe goods in the open kier in roll form. Ten to twenty pieces are stitched together making an average of several thousand yards. This winds around from one roller to another while passing through the liquor.

It is obvious that the goods remain but a short time in the liquor before winding around the roller and being squeezed out of the liquor by the tension and weight of the goods winding on top and though several hours work may be given, the goods actually remain in the liquor but a small fraction of the time.

Moreover, the strength and lustre of the silk is usually more thought of in this operation than the whiteness of the silk which is the principal object for which the operation is performed. So careful is the bleacher of the two former properties of the silk fiber that he allows the temperature to get below that the goods are supposed to be given, so as to be on the safe side. That this argument is not a supposition, but a truth, may be proven from the fact that at each end of the huge roll about 50 yards are whiter than the rest of the goods, showing where the end piece was left every other time the top end of the roll and not squeezed out thoroughly, then immediately passing again through the liquor these get a better scouring, consequently are a purer white after the final bleach in proxide. There is another thing to be considered, *e. g.* that the silk stripe as received from different manufacturers may contain different amounts of glue, which is only natural, hence the same treatment may not do for one lot that was successful for another.

Some samples, analyzed, contained as much as 18 to 22 per cent of sericin or soluble glue. Hence the proper and surer way of avoiding any bad results is not to call the scouring process complete until a sample or more after washing and dyeing will show the silk white or a very pale straw color. I must note here that the yellow color of the silk could be removed in the proxide bath, provided the latter be made stronger than it is usually made and heated from 180 to 190 degrees, but this is never resorted to, first on account of cost and second, because very few bleachers will dare to heat up the peroxide bath to such a temperature for fear of injuring the silk, though silk may be boiled in a neutral solution of peroxide without injury.

A better, I would say an ideal way of scouring silk and cotton goods is in the rope form. The goods come in contact with the soap liquor more often, the liquor is not squeezed out during the operation and in this way less time and a better scouring is the result. The best temperature of the soap bath is 190 to 194 degrees, but there is no danger in boiling the liquor. The latter temperature is not advisable with silk yarn, where there is danger of tangling up the threads and does not apply to silk and cotton. That the soap must be of the best quality should be the main point of the bleacher, otherwise than this there is no danger in this operation and the bleacher has no excuse for allowing the temperature to fall below 90 degrees, unless it is ignorance.

So far I have succeeded in showing that the yellow color of the silk after bleaching is nothing but the natural coloring matter present in the silk which was not properly removed, but there is another cause that renders the silk yellow, which is more dangerous as the color can not be removed by any means. It is fast both to chemicals and light. This latter cause is imperfect bleaching, or rather, imperfect preparation of the bleaching liquor.

Silk is a proteid and reacts chemically as such. According to Mulder the chemical composition of silk is as follows: fibroin 53.37 per cent, gelatin 20 per cent, albumen 24.43 per cent, wax 1.39 per cent, coloring matter 0.05 per cent and resinoids and fatty matter, 9 per cent. It gives the usual reaction of proteides with Millions and Adamkiwiz's reagents and also the biuret test. And as does albumen and proteids, silk reacts towards oxidation similarly, that is it is not affected by any oxidizing agent in a neutral solution, but in alkaline and acid solutions it is readily oxidized. In an alkaline solution of potassium permanganate and also in hydrogen peroxide it gives rise to COOH from the original CO, otherwise the albumen is not affected and gives the usual reactions.

I mention all this so as to make clearer the argument that is to follow. On the former theory that silk is not affected by a neutral solution of hydrogen peroxide is based the present process of bleaching silk. But very little consideration has been given to the effect of oxidization in the presence of acid or alkali. On the contrary it is advised to make the bath alakline as the oxigen is liberated more quickly. A close study of the theoretical preparation of the peroxide bath from sodium peroxide with that in practice shows a slight difference which is causing sometimes a whole lot of trouble.

Theoretical peroxide bath.

700 pounds cold water.

5.4 pounds sulphuric acid 1.8 Sp. Gr.

4 pounds sodium peroxide.

Mix the acid and the water, add 100 to 200 lbs. of ice then slowly and with constant stirring add the sodium peroxide, dissolving the first portion before the next one is added. test with litmus paper, if alkaline add a small portion of acid until an acid reaction is obtained, stir, add a small quantity of sodium silicate until alkaline to litmus paper.

Peroxide bath as usually prepared.

Water, 1,000 pounds.

Sodium peroxide, 5 pounds.

Sulphuric acid, 6⅔ lbs.

Mix the acid with the water, add the peroxide in 4 or 5 portions and stir well. The solution should be of an alkaline reaction, if acid, add a measure or so of sodium silicate until alkaline in reaction.

The difference between these two methods is that while the former takes care that each portion of the sodium peroxide should be dissolved before the next portion is

added, that the finished solution should be made acid if alkaline and then brought to the alkaline side with sodium silicate. The latter method ignores these points. The result is that sodium peroxide, not being very soluble in cold water, falls to the bottom, where it accumulates with every addition so that when the solution is tested it is most of the time acid in reaction and an addition of silicate is necessary, but after the goods have entered and the temperature is raised, the undissolved particles of sodium peroxide dissolve and instead of a slightly alkaline liquor the latter is rather strongly charged with alkali.

Under such conditions the silk is oxidized, acquiring a yellow color which as mentioned before is fast both to chemicals and light and cannot be removed.

The following test, which was repeated several times with the same results, *e. g.*, the silk turning yellow, will speak more strongly than words of the importance of taking more care in the making up of the peroxide liquor:

A perfectly bleached piece of silk and cotton or silk alone is placed in a wide mouth bottle and a solution of hydrogen peroxide made alkaline with excess of sodium peroxide is added, the bottle is loosely corked and placed in a water bath. According to the strength of the solution and temperature the silk will turn yellow in about 45 minutes.

It would be advisable for the bleachers who have at any time experienced such difficulties to try this simple experiment for themselves.

In concluding this article I would say that the theoretical method for the making up of the peroxide bath is perfect. The addition of ice is important, as the chemical reaction of the acid and sodium peroxide raises the temperature which will cause a loss of the hydrogen peroxide. But the most important point in the theoretical process is that of making the solution acid after the last portion of sodium peroxide has been added and then only add the sodium silicate.

It may seem ridiculous to practical and busy bleachers to use such a roundabout way. To make a solution acid if alkaline then again go to work and make it alkaline with sodium silicate. Why not stop there at first? But if we consider that not any kind of an alkaline solution of sodium can be used with good results, but the slightest excess of the alkaline is only necessary, it will be obvious that a solution that will turn red litmus blue does not show how much of the alkaline is present, that at one time it may be more and at another time less; that such may be the case of mixing weighed quantities of sodium peroxide with sulphuric acid at different times, hence this point of acidifying the solution if alkaline or even when it is neutral and then bringing it over the alkaline side with silicate of sodium is not meant for a student and should not be ignored at any time. I do not want to make this process too complicated otherwise I would advise to heat up the peroxide bath to 120 degrees F., stir up well, test, if found alkaline add small quantities of acid until acid to litmus, then add sodium silicate until alkaline to litmus. If the solution be acid after bringing the temperature to 120 degrees add sodium silicate. Of course, it is better to heat the solution when it is acid in reaction while cold as the loss of hydrogen peroxide is less.

For every dollar not spent on export development now, five will have to be spent later on.

COMPOSITION OF WATERPROOF FABRICS.

BY J. F. X. HAROLD, PH. D.*

The rendering of fabrics impermeable to water is an industry of constantly growing magnitude and one attracting the textile manufacturer by reason of the simplicity of the processes, the pronounced increase in the value of the goods after treatment and the extension of their use. Many manufacturers avoid the installation of water-proofing plants who would profitably conduct them if they were aware with what simplicity their goods may be given an added market and usefulness. Fear of complicated, tedious or costly processes involving long acquaintance with the work dissuades them, and a good source of income is thus overlooked or unwisely avoided. Any plant equipped for piece dyeing can handle a large number of water-proofing processes with no new installations, and a well-equipped finishing plant can put through nearly all of them. Some recipes are easier to handle than the simplest size, and, indeed, are as little complicated as piece-dyeing. Nor is it to be thought that these simpler processes produce goods of a less valuable character, for many formulæ requiring no more than the use of the jigger and a bath less expensive than the average mordanting and dyeing process demands, yield goods of quite a satisfactory kind, indeed superior to many developed by the more complicated recipes.

The methods differ largely in the materials employed, in the appearance of the treated fabric and in both the degree and kind of water-proofing produced as well as in the manner of application of the various compounds. Of the countless recipes advanced each of them may be said to follow one of a few general methods of water-proofing and the immense number of formulæ given are for the most part slight variations on a few standard processes.

Viewed in a general way, the waterproofing processes may be reduced to about five in number, the recipes falling into this limited classification either by reason of the common chemical character of the materials employed or the similarity in the manner by which water-proofing is secured.

The first method and one which has the largest number of modifications is that dependent upon the production of an insoluble water-resisting salt of a metal upon the fiber. This covers all formulæ where soluble salts of various metals are first placed upon the fabric and afterwards changed to insoluble ones by dipping in a second bath or exposing to air. As examples of this process, we have the wetting-out of goods in an alum bath, followed by the use of a soap bath, or the use of a bath of aluminium acetate followed by drying in air.

Another class of processes consists in soaking the goods in a solution of albuminoid material, then following this by treatment with a metallic salt or base. An example of this process is the treatment with a solution of casein followed by lime water.

A third general class differing sharply in its operation in the material employed and in the method of application is the use of oils, fats, waxes, resins, etc., in producing a water-resistant fabric. Here the water-resisting material is ready formed. No chemical reaction is demanded, nor subsequent treatment, the material penetrating the fiber and being at once effective.

A widely varying class of operations is that demanding

*Extracts from a paper read before the Alumni Association of the Philadelphia Textile School.

not a mere absorption by the fiber, but a true coating with a water-resistant medium, such as rubber or varnish as in the production of oil-skins and some classes of rain-coats.

Finally we have for cotton goods a process which cannot be considered under any of these classes. This consists in covering the fabric with a solution of cellulose in a copper solution and reprecipitating the cellulose upon the fabric after allowing time for a partial solution of the upper surface of the fabric itself. This yields a parchment-like coating which resists water. This process is the sole example in its class, while the other classes have countless representatives.

In addition to the marked variation in the classes of materials employed as above indicated, distinction must be made in the degree of water-proofing brought about by these processes. The degree of water-proofing varies with the use to which the fabric is to be put. Some fabrics need merely to be made water-shedding, and from the nature of their wear satisfactory results are thus yielded. This is the case with the water-proofing of practically all woolen goods which are used as garments. A more prefect water-proofing in the strict sense is not demanded here, and indeed would be a hindrance to the free circulation of air through the goods. A case in point is the cravenette process; in the normal use of garments so treated there is no water pressure to be withstood, simply the beat of rain drops or the negligible weight of a little water upon the goods which is readily shed. These water-shedding fabrics are usually made by the first or the third general class of processes above referred to.

Water falling upon a non-absorbent surface, such as is furnished by an oiled or waxed fabric, does not flatten out or tend to penetrate, but assumes the spherical condition, and by what is called "surface tension" resists the passage through the goods. This "surface tension" is seen in a marked degree to be a stronger influence than the attraction of gravity or of capillary absorption when a soap bubble rests on a piece of carpet.

With regard to the first mentioned class of processes depending on the development of a precipitate on the fabric which is water-resistant, the salts of aluminum are of especial importance. Aluminium acetate impregnating the fiber, followed by drying, is with closely woven goods an effective waterproofing agent. Its effectiveness depends on the volatility of much of the acetic acid and the consequent residue of a highly basic acetate of aluminium which in common with most basic salts is insoluble. Still greater water-proofing effect is gotten if the fabric is plunged into a bath of soap after drying again, the aluminium soap thus formed being an especially good water-shedding material.

The second process involves the employment of albuminoids usually followed by material which causes their precipitation as insolubles in the fabric. Glue, casein or gelatine are the usual albuminoids employed in the first treatment of the fabric, while among the many precipitants which may be employed in the second bath are tannin, salts of chromic acid, lime, aluminium salts and formaldehyde, the latter either in solution or in the vapor condition. Hundreds of formulæ follow the lines here summarized.

The third general method involving the application of fats, oils, waxes or resins to the goods is the most commonly employed for woolens and outer garments in general. Ordinary fats and waxes applied to the goods in solution in some such solvent as benzine have the advantage of leaving the fabric permeable to perspiration vapors while shower-proof at the same time.

There are various ways of applying the oils, fats, waxes or resins to the fabrics, the most common one being in solution in various organic solvents.

A cheap and yet effective means for attaining the same end is patented and uses a simple water emulsion of the fats or oils and even of waxes.

Among the materials employed in the first method of treatment under this class, we have to consider the mineral oils of high boiling point, ceresine, paraffine, Japan wax, carnauba wax, lanolin, stearic and palmitic acids, tallow, cocoanut oil and the various resins, wood tar, coal tar, Venice turpentine, vaseline, beeswax and finally various gums, such as sandarach, dammar, etc.

In the water-proofing of fabrics with drying oils, varnishes, etc., we have a complex method combining the water-shedding properties introduced by fats and oils and the water-tight condition due to the production of an elastic, continuous, unbroken layer of insoluble material.

In this second division of the third general method of water-proofing the commonly employed materials resemble paint in the composition, that is, linseed oil, or oxidizer, a drier and a mineral pigment or filler are used in combination. While other drying oils are at times employed, linseed oil is used almost exclusively.

With the fourth class of water-proofing processes we have a direct production of a coating of insoluble material above the surface of the fabric, usually a complete disappearance of texture, but without any preliminary oiling of the fibres as was demanded in the second division of the previous process.

The last sort of water-proofing involves so unique a method that it is incapable of classification under any previous head, nor does it remotely resemble any heretofore cited process. This consists in the deposition of cellulose solution on the surface of the fabric followed by the removal of the solvent or the coagulation of the liquid, so that when the cotton goods are finally water-proofed no matter foreign to the cotton is present. The goods consist of cellulose throughout and yet the fabric is waterproof. The cellulose may be applied to the fabric dissolved in a cuprammonia solution or in zinc chloride. The first process leaves the mesh of the fabric completely sealed by cellulose, but stained with copper salts which, however, are easily removed by treatment with acid. The zinc chloride solution of cellulose is frequently used in combination with such fillers as clay, talc, starch and pumice, and after the coagulation and fixation of the cellulose these aid in giving the goods a better surface and make them more impermeable.

It is stated in Manchester, England, that pure goods, both in drills and jeans for native dyeing, are in request in China, and letters from Shanghai state that this style of cloth is superseding the heavier sized makes. Fancy striped and raised twills remain in good demand for Hongkong, and many of the leading Lancashire makers are exceedingly busy. Bleached satin drills are well under order for Calcutta and Bombay, and to some extent the better grades of sized cloths. Low makes are, however, selling more freely for Rangoon.

You cannot wish export orders into your books.

THE DEVELOPMENT OF THE NEW INDIGO DISCHARGE PROCESS BY THE USE OF NITRATES AND NITRITES.*

(*Translated for* COTTON).

BY ERNEST STUTZ.

In order to establish the origin and development of Mr. Freiberger's process and in accordance with the custom of the society, the contents of eight sealed envelopes which the inventor deposited from July, 1906, to September, 1908, were read at a meeting of the society.

Envelope one deposited July 31, 1906.

The discoloration of indigo by nitric acid is a method of analysis which has been known for a long time.

This laboratory method is not available for industrial purposes on account of the corrosive action of nitric acid on fabric and cylinders. The occasional use that has been made in block printing or with Perrots printing press mostly concerned only light indigo and did not enter into regular industrial operations.

These considerations induced Mr. Freiberger to use nitric acid as it is freshly evolved from nitrates under the influence of a stronger acid. The first experiments showed that nitric acid was active only when concentrated and at a comparatively high temperature. This necessitated using print color with up to 140 gr. nitrate of soda per liter thickener and inducing decomposition of the salt by a very rapid passage (4 to 5 seconds) in sulphuric acid at 41 degrees Be. (measured at 15 degrees C.) heated to 65 degrees and over.

The likewise very rapid rinsing is followed by alkali neutralization (soda salt, caustic soda or silicate).

The white is pure, but the fabric has undergone a slight change.

Envelope two deposited August 13, 1906, deals with the use of nitrate of lead.

A good white with clear outline on dark indigo is obtained by printing

400 gr. nitrate of lead
50 gr. nitrite of soda
550 gr. thickener
1000 gr. in all.

Thickener for light patterns. Two parts thick tragacanth starch paste; one part insoluble gum liquified in proportion of 1 to 2½, one to five parts water.

Cutting bath: 400 gr. sulphuric acid at 66 degrees Be.; 1000 gr. water at 92 degrees, 4½ seconds passage, squeezing and immediately rinsing.

The discharge does not produce oxycellulose, the white remains unaltered, even after treatment with alkali and lye.

The lead sulphate remaining on the fiber can be turned into chrome yellow by subsequent passage through bichromate.

By slight dipping of the indigo in naphthol one can, by the same method, obtain simultaneously red and yellow discharges on blue ground.

Envelope three deposited October 10, 1906, treats of azo colors developed on the fabric, discharged on indigo.

The deep vat blue is prepared by

16 gr. B naphthol R.
16 gr. NaOH 40 degrees Be.
30 gr. soap to one liter.

Red discharge PN is printed: 10.500 kg. discharge white containing 300 gr. lead nitrate per kg. tragacanth; 2.700 kg. diazo solution; 330 gr. acetate of soda; and 700 gr. nitrite of soda.

The Diazo solution: 80 gr. paranitraniline, or 100 gr. paranitroorthoanisidine per 1 liter, diazoted with HNO^3 (instead of the generally used HCl). Dilute the developing color according to the intensity of the indigo. Pass through 400 gr. H^2SO^4 at 66 degrees Be. and 620 gr. water at 82 degrees C., allowing three seconds for passage in a box containing only one dipping roller. After rinsing pass through NaOH at ½ degree Be. and wash. The process gives good results on a large scale.

Envelope four deposited October 11, 1906, on white discharge on vat blue prepared with naphthol.

The inventor proves that chromate and acid discharges produce infallibly oxycellulose and that the other discharges by oxydation agents give a dirty white which it is impossible to purify. He obtains a perfect white on a deep vatted blue prepared with naphthol by the following method: Dip slightly in 16 gr. B napthol R., 16 gr. NaOH 40 degrees Be., and 33 gr. of soap for 1 liter. Print with white ZB:

5 kg. Zinc nitrate at 66 degrees Be. obtained by ZnO and HNO^3,
13 kg. Tragacanth starch thickener,
1 kg. Boracic acid.
19 kg. Total.

Print simultaneously a color containing paranitraniline or diazoted paranitroorthoanisidine, steam four minutes and pass through acid containing 36 per cent H^2SO^4 at 80 degrees C. Immerse for three seconds, rinse and wash in alkali solution. Boracic acid has a remarkable action as it decomposes the sodium naphtolate, otherwise the nitric acid would produce a dirty white like in the old methods.

Envelope five deposited December 10, 1906, on white and ice colors discharged simultaneously on vat blue.

What takes place is very similar to the reactions which occur in the lead chambers of sulphuric acid manufacture. The solution of nitrogen oxides in strong sulphuric acid in the presence of SO^2 acts more energetically and a better white is obtained by the addition of sulphite (or even hydrosulphite) and nitrite to the color.

Nitrates of soda, lead, zinc, etc., may be employed. By the addition of certain weak acids or their salts, the tendency of the nitrates to decompose during the passage through H^2SO^4 is increased. Besides the above mentioned boracic acid one can usefully take aluminum acetate or small quantities of formic acid. Stronger acids give a brownish white and this comes from premature evolution of nitric acid. The naphthol contents in the mordanting must be confined to the amount strictly requisite in order to obtain the diazo color desired. For instance for the paranitroorthoanisidine red, 10 gr. napthol per liter are sufficient. Similarly alkali naptholate may be replaced frequently by soap. This avoids the white "halo" which might result from steaming in the ager.

These inconveniences could be avoided by the use of acetate of lead in place of acetate of soda to neutralize the free acid of the azo solution. Excellent results are also obtained by the addition of borate of zinc paste which produces boracic acid and zinc nitrate, the latter being very suitable for the discharges.

*Being a report by Felix Binder in the Bulletin de la Societe de Mulhause.

For thickener there is a choice according to pattern between gum and starch; the latter is better for white.

The best conditions for discharge result from H^2SO^4 at 38 degrees Be., at 80 to 82 degrees C., 2¾ seconds, the Be. degrees being measured at 17 degrees C.

Large quantities of goods have been treated by the inventor according to the following formulas:

Red discharge for indigo:

10 gr. B napthol R. (Hœchst).
8 gr. NaOH 40 degrees Be.
33 gr. soap RC
to 1 liter.

Soap RC is made by combining 20 kg of castor oil saponified with 17 kg. NaOH at 22 degrees Be. and decomposed with 4.4 kg. HCl. Decant the soap when cold.

White LF

400 gr. zinc nitrate chem. pure
53 gr. boracic acid
547 gr. starch thickener at 150 gr. per liter.
1000 gr. total.

To this add 10 gr. potassium sulphite at 45 degrees Be., and 25 gr. aluminum acetate at 9 degrees Be. (by lead acetate + aluminum sulphate). Before printing add 12 gr. formic acid at 85 per cent.

Red discharge FZ:

180 gr. white discharge (317 gr. Pb $(NO^3)^2$ + 683 gr. tragacanth thickener hot.
500 gr. tragacanth thickener.
500 gr. very thick tragacanth starch thickener.
270 cc. Diazo solution.
80 gr. BZ paste.
78 gr. $NaNO^2$.

Paste BZ is formed by mixing 1350 gr. sulphate of zinc and 2990 gr. borax. Wash after precipitation and add to 7380 gr. of paste.

Diazo solution:

84.5 gr. paranitroorthoanisidine.
167 gr. HNO^3 at 35.5 degrees Be.
150 gr. water.
250 gr. water and ice.
37.8 gr. nitrite.
100 gr. water. Let stand and after half hour make up to 845 gr.

With nitrotoluidine orange tawny 5 minutes steaming is necessary for sulphuric acid discharge.

Envelope six deposited April 29, 1907. Nitrate discharge, yellow alone or with para red and white:

Discharge:

317 gr. Pb $(NO^3)^2$.
650 gr. tragacanth thickener.

then cold

33 gr. K^2SO^3 at 45 degrees Be.
1000 gr. total.

Pass through sulphuric acid at 39 degrees Be., three seconds immersion at 70 to 82 degrees C. according to pattern and depth of indigo in a lead-lined box with rollers and squeezers of vulcanite and rubber. Rinse, pass into lime water and dye in chromate of soda. Where yellow is to be combined with paranitroorthoanisidine, the napthol preparation is made first.

In three color painting, white, red and yellow simultaneously, one steams after printing in the ager from 1 to 5 minutes according to the extent of the white. After discharge, rinse, neutralize in silicate at 1 degree Be. 20 seconds immersion at 90 degrees C., wash and dye one meter of fabric in a bath of 15 to 25 cc. of 100 gr. biehromate of soda 13 cc. sulphuric acid at 66 degrees Be. per liter of water.

Envelope seven deposited November 13, 1907, entitled Discharge Resists on Indigo:

Nitrates may be mixed with sulphites, hydrosulphites, stannous oxides or other reducing agents.

A color of such composition is capable, in the presence of free alkali, of fixing diamine or indanthrene colors and to preserve the over printed diazo prints, nevertheless discharging the indigo in a later passage through sulphuric acid.

This method gives a discharge resist which at one and the same time is reducing and oxidizing. For instance, a color containing nitrate and hydrosulphite will reserve an azo red either direct or discharging and at the same time will discharge the indigo during the passage through sulphuric acid. Such colors will last very well when they are slightly acid. Flavanthrene R is fixed by adding it to that color with some caustic soda. Steam quickly and pass through sulphuric acid. This method allows a number of new effects, for instance:

Flavanthrene Yellow:

60 gr. double Flavanthrene R (double).
120 gr. Oxide of zinc paste.
50 gr. Glycerine.
60 gr. nitrate of soda dissolved.
670 gr. alkaline thickener.
120 gr. nitrate of soda.
30 gr. nitrite of soda.
30 gr. water.

Alkaline Thickener.

7.5 gr. dextrine.
12.3 gr. gum arabic dissolved 1:1.
5 liter water.
40 gr. caustic soda at 45 degrees Be. heated to 70 degrees C.

Diamine Yellow:

15 gr. diamine golden yellow.
30 gr. boiling water.
155 gr. nitrate of lead thickened (317 + 683 gr. tragacanth).
10 gr. glycerine.

White Reserve Under Red Discharge on Indigo:

300 gr. nitrate of lead thickened as above.
130 gr. hydrosulphite thickened (1 part hydrosulphite NF conc. + 1 part starch thickener).

Envelope eight deposited September 26, 1908, on nitrate and nitrite discharges, contains an abstract of all the previous observations and in itself brings nothing new.

This Freiberger process is new. The preceding bibliography mentions no earlier application. This fact is confirmed by various patents which have been granted and which would have been refused or upset, if they were based on facts known in the prior art. There can therefore be no objection to declare Mr. Freiberger's priority.

In discharging a number of pieces the inventor has sometimes noticed on the first white, halos around the discharge parts of azo colored goods and particularly where steaming precedes the acid passage. This accident is due to very soluble elements in the colors. It can be avoided by replacing soda acetate by borax or boracic acid.

The red discharge should have, for instance, the following composition:

650 gr. tragacanth starch thickener.
100 gr. nitrate of soda.
15 gr. borax.
25 gr. boracic acid.
250 gr. paranitraline sol. at 10 per cent.

Mr. Freiberger has also used for red and rose a mixture of nitrosamine and B napthol with an addition of nitrate of soda.

Blue and green are obtained by pure Prussia blue and mixed with a direct yellow. Indanthrene steam blue is likewise applicable, also yellow and chrome orange. The latter are shaded by the addition of aniline black.

It is mostly of advantage to diazote in the presence of nitric acid which the latter neutralization converts into nitrate and which is utilized as the discharge element.

The nitrate print colors keep better than other discharge colors and are therefore very suitable for continuous production in large quantities.

NOTES ON DYEING, BLEACHING AND FINISHING.

The Newest and Latest Chemical Facts from the Laboratories of the World. Prepared for and Contributed Exclusively to "Cotton."

BY J. MERRITT MATTHEWS, PH. D.

The Acetylation of Cotton Cellulose.

Schwalbe has previously shown that in every process for the preparation of cellulose acetate, hydrocellulose is produced and he has suggested that hydrolysis of the cellulose is an essential and primary stage in the acetylation. In further investigation of this subject Schwalbe has now shown that if the acetylated products be separated from the undissolved cotton after the first 5 to 10 minutes of the reaction (acetylation with a mixture of acetic anhydride, acetic acid and sulphuric acid) these acetylated products have a considerable reducing action on Fehling's solution. Curiously the undissolved cotton separated at the same time has practically no reducing action and must be regarded as virtually unattacked. This circumstance is due to the very different velocities of acetylation of cellulose and hydrocellulose. Experiments conducted under identical conditions show that after five minutes treatment with the acetylating reagent cellulose was converted to the extent of 74 per cent and further that from a mixture of cellulose and hydrocellulose the whole of the hydrocellulose had been converted. The formation of acetylated products having a cupric reducing power is characteristic of the early stages of acetylation. At a later stage the product had no action on Fehling's solution, but in the last stages of complete acetylation the products are again found to reduce strongly. This intermediate non-reducing stage occurs not only in the acetylation of cellulose, but also in the acetylation of hydrocellulose. Schwalbe considers that he has now definitely proved that in the acetylation of cotton the cellulose is first converted into hydrocellulose and that the latter then becomes acetylated very rapidly. Incidentally it is remarked that the conversion of cellulose into hydrocellulose takes place far more rapidly in the ordinary acetylating mixtures (a perfectly anhydrous medium) than in 97 to 98 per cent glacial acetic acid containing an equal amount of sulphuric acid.

Color Vision Among Primitive People.

It is a well-known fact that the sensation of color, like all our other faculties, is capable of being trained by education and experience. Children, for instance, are less sensitive in their perception of color than older people, while artists and dyers who are constantly employing their faculties in the matching and differentiating of various colors, will have their color sensation developed far beyond that of the normal man. Dr. Meyers has investigated the possible color sensations of the early Greeks in a somewhat novel manner. He assumes that any nation that noticed or appreciated a color would probably invent a name for it, and though we have no means of ascertaining by direct evidence the color sensations of the early Greeks, we can readily investigate their language with reference to what they may have to say with respect to colors.

The result of this investigation has proved to be rather astounding, and leads to the conclusion that though the Greeks were the acknowledged leaders in the artistic world, they probably passed color by with but little notice or appreciation. In the Iliad the terminology for color is very vague. Several words occur there for red, and one word is definitely used for yellow; a much less definite name is used for green, and there is no definite word for blue or brown. Hence we are to conclude that the Greeks may have had some notion of red and yellow, but scarcely any of blue.

These peculiarities of terminology are not characteristic of Homer, but are also to be found in the ancient writings of other parts of the world—for instance, in the Zend Avesta, and the Norse Edda. We must conclude, therefore, that our color sensation has been evolved in rather recent times, and that the sensation of red and yellow arose previous to the sensation of green, and that only at a much later date did the sensation of blue develop. The lack of appreciation of blue colors is found to be not only common to the ancients, but with one striking exception, is shared by most primitive peoples. The inhabitants of Murray Island in the Torres Straits, live in a land where nature supplies colors in splendid variety and profusion. Yet they have very few words in their language descriptive of colors. There is a definite word for red, two words for orange and yellow, a definite word for green, but none for blue. They use the same word to describe jet black and the brightest blue. A test was conducted on these people for color-blindness, a hundred and fifty of them being given skeins of colored wool and being asked to match them from a heap of variously colored skeins. Of this number of Europeans, there would probably be six who would have been color-blind; that is to say, unable to distinguish between red and green; but of the natives none was thoroughly color-blind, hence their vision was more healthy than that of Europeans. But they confused reds and pinks, greens and blues, and blues and violets, and matched pale-greens and blues with pinks. Many other tests were also carried out, all of which went to prove that these natives were apparently insensitive to blue.

An interesting exception among the ancient peoples was that of the Egyptians. They evidently had a very keen perception of blue, and had a definite name for the color, and employed it very frequently in their paintings. A remarkable contrast between the ancient Egyptians and those of modern times is that while the latter still have a name for blue, they show a very marked insensitiveness to this color when tested.

Practical Problems Discussed by Cotton's Readers

We invite our readers to make use of this department for the discussion of any and all problems arising in the mill or the finishing plant. Questions, answers or letters need not conform to any particular style and will be properly edited before publishing. The editors do not hold themselves responsible for any statements of opinion or fact which may appear in this department unless so indorsed. This department is open to all.

FURTHER SUGGESTIONS ON THE QUESTION OF A. C.

EDITOR COTTON:

In my letter in the May issue, I used the word twaddle purposely and for two reasons: (1) to bring "A. C." back at me for did I not say that he knew a great many things that are not so on fly frames; and (2) twaddle is a word commonly used to express an opinion of persons that hold to things that are impossible.

It is impossible for a strand of roving to gain twist after passing the top of the flyer and entering the hollow leg. The hollow leg of the flyer supports the strand only. "Carder" surely has no monopoly on wisdom when he puts me down as the twaddler, and then gives us a table that shows a loss of twist from beginning to end, and concludes by asking where the extra twist comes from. 3.0127 turns (calculated), two wraps 2.825 average turns, three wraps 2.14 average turns, four wraps 2.9875 average turns. This is a loss of twist in each case not a gain.

"A. C." made the earlier statement that if "Y. L. Y." would take the trouble to prove what he said on a twist testing machine he would find that the twist was affected so much that the roving would keep breaking, while roving made on the same speeder with three turns around the presser, would run off all right This was what I called "twaddle." Now examine the table given by "Carder" and follow the results from two and three wraps around the presser, and can a fair minded reader admit that the difference found in eight inches of roving would cause the roving with two wraps to keep breaking while the roving with three wraps would run off all right.

Let us use "Carder's" table, which appears to be a very honest test, and let me add that "Carder" deserves credit for trying to convey to us what he believes to be right. We have to begin with 3.0127 turns to the inch (calculated). By wrapping the strand around the horizontal leg twice, less resistance is offered to the strand passing over said leg. This in turn allows the diameter of the bobbin to increase faster than those having three wraps, therefore stretching takes place. Now read the letter by "A Student," (Alabama) in the May issue and it will be at once seen where the twist is lost.

When we increase the number of turns on the presser, we do not gain twist (which is proven by "Carder's" 18½ hours' test) but we prevent a certain amount being lost. This is proven also by "A. C." himself on page 363 of the July issue.

The whole trouble with this complicated problem is that the present type of fly frame is the most imperfect machine in a cotton mill. If "A. C." or "Carder" have a flyer-lead frame in the mills in which either work, I advise that the same test be made and very little if any difference will be found between two and three wraps around the presser. I have both running in my mill, and if both these gentlemen care to make the trip, I would gladly have them come and pay me a visit, and at the same time make several tests.

Twist on a fly frame comes and goes. When the spindle revolves and inserts the twist and the construction of the strand made spiral, the convolutions run from the top of the spindle to the bite of the drawing rolls. On the other hand, after the strand is twisted it is drawn by the excess speed of the bobbin over the flyer down the hollow leg. So, in the first case, the twist goes (away from the spindle) and in the second place comes.

One can never prove the figured twist in a twisted strand on fly frames for several reasons, one of which is that owing to the strand not being firmly held at the termination of the presser the strand loses some of the convolutions. If the strand was held as firmly between the paddle and the surface of the bobbin as it is by the drawing rolls then we could obtain almost the figured twist.

Another reason is that even if the twisted strand was held firmly at both ends, one could not obtain the figured twist, for most of us know that the twist runs to where the less amount of fibers exist in the cross section of the strand. For this reason "Carder" should be somewhat ashamed of the table he presents. Stretch No. 8 shows his work uneven in spots. To prove this reasoning examine test No. 2 and No. 8. Test No. 2 shows no difference in twist when wound two and three times around the presser, while four times shows 2.5 more twist. Test No. 8 upholds this reasoning by showing a difference 2.75 turns when wound two and three times around the presser and no variation between three and four turns.

These conditions cannot be laid to the spindle or the rolls, because their speeds are constant. So we must turn our attention to the construction of the strand, which is made uneven either by the drawing rolls, or the stretch which results from the rapidly increasing diameter of the bobbin caused by not having the number of turns around the presser for which the modification of the cones call.

When we wind the strand around the presser three times we cause the paddle to hug the surface of the bobbin more closely, as more resistance is offered the passage of the strand over the presser finger when the number of turns are increased. When the paddle is made to hug the bobbin more closely, the diameter of the bobbin is not only reduced to suit the modification of the cones, but the tension then comes between the paddle and the surface of the bobbin. When we wind the strand four times around the presser we have then all the tension between the paddle and the surface of the bobbin and no tension between the bottom of the hollow leg and the bite of the front rolls, and for two reasons, (1) owing to the increased tension, the diameter of the bobbin is reduced and causes a continued slack tension between the bottom of the hollow leg and the bite of the front rolls, and (2) the cones being designed for only three turns around the presser. On the other hand, when we wind the strand only twice around the presser, the

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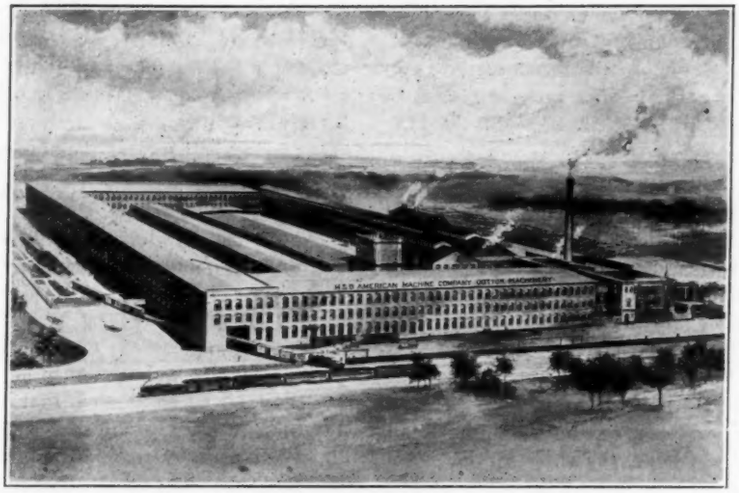

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tension then becomes mostly between the hollow leg of the flyer and the bite of the rolls, and the strand is more easily stretched here, owing to the distance.

For these reasons one can at all times prove more twist in a strand having the most turns around the presser.

What does the whole controversy amount to, anyway? Even that we now know what has been proven in this letter, what can we do about it? Why not, instead, point out in this department evils that we have discovered in our practical mill experience, and we would by so doing no doubt draw similar experiences from the majority of the readers of this department which would surely prove beneficial to all of us. I believe this department is constantly growing in popularity and usefulness and we can by cooperation increase its value still more. Wash, (New York)

EDITOR COTTON:

I see an article in COTTON for July where I have been misquoted by "Carder," (Massachusetts), and I would like to correct it. He would like to have the readers believe that I said tension or laps around the presser causes twist. I did not say so. That was the reason I tried to write on the subject that was being discussed because I thought it was foolishness to try and make people think any such thing. In regard to the tests he gives I don't think he has proven very much, for we know it is a very difficult thing to get the twist in roving with a testing machine, and get it down to as fine a point as he has done, .0735 turns, or about 1/14 of a turn to the inch and I don't think we could find any two men who would get the same results. We find throughout the tests both with 3 laps and 4 laps, some are right, some below and some above the twist calculated. The average of 20 tests he shows between 3 laps and 4 laps the difference of .0735 turns per inch or 1/14 of a turn. But if we look at the variations in twist from the same roving; for instance the one with 3 laps the greatest variation is .344 or about ⅓ of a turn and the one with four laps .50 or ½ of a turn. Now if we have the variation of ⅓ of a turn from the same roving with 3 laps and ½ turn with 4 laps, I don't see where he has proven very much when he gives the variation of 1/14 of a turn from two different rovings with different laps.

I believe we carry discussions of this kind too far and dwell on small points that do not do any good, for I don't believe 1/14 of a turn to the inch in roving (if it was there) would cause any trouble in running it afterwards. I think there could be discussions on other things that would be of far better use and much more interesting than these which are carried to a mere trifle. Such subjects as the one in July issue by "G. F. P." and lots of others such as finding the production throughout the different departments of the mill. The best way for finding and keeping the production of the spinning room; with a hank clock and without; also the pounds per spindle per week on the different numbers of yarn from the hank clock and without. The best system for keeping the machinery and floor clean and the machinery oiled. The best way of handling the yarn from the spinning to the spoolers and winders, including spooling and winding. The ratio of spooling spindles to spinning spindles. Calculations for gears, twists, drafts, speeds, yarns and production. Also the most correct way of getting the production.

The best way of keeping down waste in all departments. Why some departments are short of help while other de-

partments have an abundance. These are some of the problems that we should take up and try to get the different ideas from different readers and put them together with our own and use them to the best advantage to ourselves and our employers.

I hope the readers of COTTON will take up some of these problems and a great many more. Let us make the practical problem discussion part of COTTON be of increased interest and benefit to all and stop dwelling on these fine points that do no good. This, of course, expresses my personal opinion, but I believe this opinion will be concurred in by many. If, however, others think differently, we shall be glad to have their views. H. E. W. (Maryland).

EDITOR COTTON:

Having read all the answers to the question of "A. C." I am still of the opinion that increasing or decreasing the wrappings on a flyer presser does not put in or take out twist, but owing to the decrease of the tension or drag between the presser and bobbin the roving is wound on in a loose condition. Hence the diameter of the bobbin is increased and of course this increases the surface speed of same, thus stretching the roving, making it of lighter hank and more yards. Now, as the speed of the spindles and hence the flyers are all the same, the twist of this roving will of necessity be the same as that of the other bobbins, with the exception of the stretching which has taken place, which will reduce the twist per inch just in the ratio of the stretch. We know that the calculated twist and the actual twist vary. That is to say, that the actual twist is always less than the calculated twist. Now with this before us we are forced to draw the conclusion that with four wrappings (where the stock will stand it) the tension holds the roving more firmly and does not allow it to slip, thus decreasing the difference in actual twist and calculated twist, as one can see by referring to the tests of "Carder." However, if the stock is not good, the four wrappings will have a tendency to stretch the roving and thus decrease the twist. I think "A. C." asked us a good one and for one, I have enjoyed the discussion. But I think we should all lay aside our rough way of criticising and making sarcastic remarks, as they are neither elevating nor educating.

Student (Alabama).

THINKS THE COTTON WOULD GIVE THE MOST TROUBLE.

EDITOR COTTON:

I find it difficult to understand clearly the question of "X. Y. Z. A." as to which is the most trouble in a cotton mill, the weather, the cotton or the condition of the mill. I have never found any of these very difficult where a remedy was available and reasonable results expected. If "X. Y. Z. A." has placed these on a level and considered the cotton mill as a whole without specializing any one department, I would say that the condition of the cotton would give the most trouble.

I have had some practical experience in all departments, from the pickers to the jacquard loom; have mixed and spun about thirty different grades and shades of cotton, including Egyptian, upland, peeler and sea island, from 4's to 150's. In taking charge of a room I would first devote the greater part of my energy to putting the machines into first-class condition and adjusting them to the stock to be handled and then to the enforcement of a set of rules as to the care of the room and machines, to which clauses may be added from time to time according to the disposition of the help and the results obtained.

As to the weather conditions, that is the heat and the moisture in the air, I keep a record every two hours. The adjustment of these needs some experience; both the inside and outside conditions must be considered in keeping this adjustment as near a standard as possible. For example: If the inside humidity was shut off and the air was still too damp (perhaps because it was raining outside and the temperature was high inside), opening the transoms and letting in a little outside air even at this time would generally bring both nearer the standard. Increasing the heat will generally tend to raise the moisture.

My idea in saying that the cotton will give the most trouble is that when one is handling a dozen or more different kinds it requires constant supervision, while in another case, when a system is once adopted, it requires little trouble to keep it up.

In the card room the amount of short stock, grade, color, general running quality and what the product is to be used for must all be considered, that is in hosiery with its soft twist where all nap and dirt will adhere to the surface in finishing, great care should be given to eliminate these and in running a warp yarn a lighter color should be mixed for warp than for filling as the excess twist tends to give it a darker shade. One must be constantly on guard to keep each stock up to its standard.

In the spinning room it must be watched to see that it holds its weight and draws properly, thus taking the correct amount of twist.

In the finishing and weave rooms it is hard to eliminate any of the former items but even here the cotton must be considered. I have always found where these things are put into practice that the production will take care of itself.

A. C. (Mass.)

ANOTHER ANSWER FOR NEW SUBSCRIBER.

EDITOR COTTON:

Referring to the questions by "New Subscriber," in the July issue, will say: First, that his cards are provided with a stripping comb that is adjustable. If his flats are not kept clean he can set the comb up a little closer to the flats, but not too close, or the back action of the comb is liable to injure the clothing. The flats are also cleaned with a revolving brush, that acts on the flats in a cleaning capacity, probably it is worn out or not set close enough.

There are various reasons why fly frames of some makes are weighted lighter than others. The machine builders have different ideas regarding the weights. There are different methods of weighting. Direct dead weights, weighting by means of a spring, the lever weighting, etc. Also the heavier the stock the more weighting is needed. Metallic rolls do not need as much weight as common rolls. The faster the r p m of the rolls, the more weight is needed.

"New Subscriber" then asks how one could set the rolls on various frames and under specified conditions. One *could* set them most any way and some mill men do set them most any way. But as this is a practical question and one that is of much importance, I will try to give a practical answer. The spacing of rollers is one of the most important points relating to cotton mill machinery. And the

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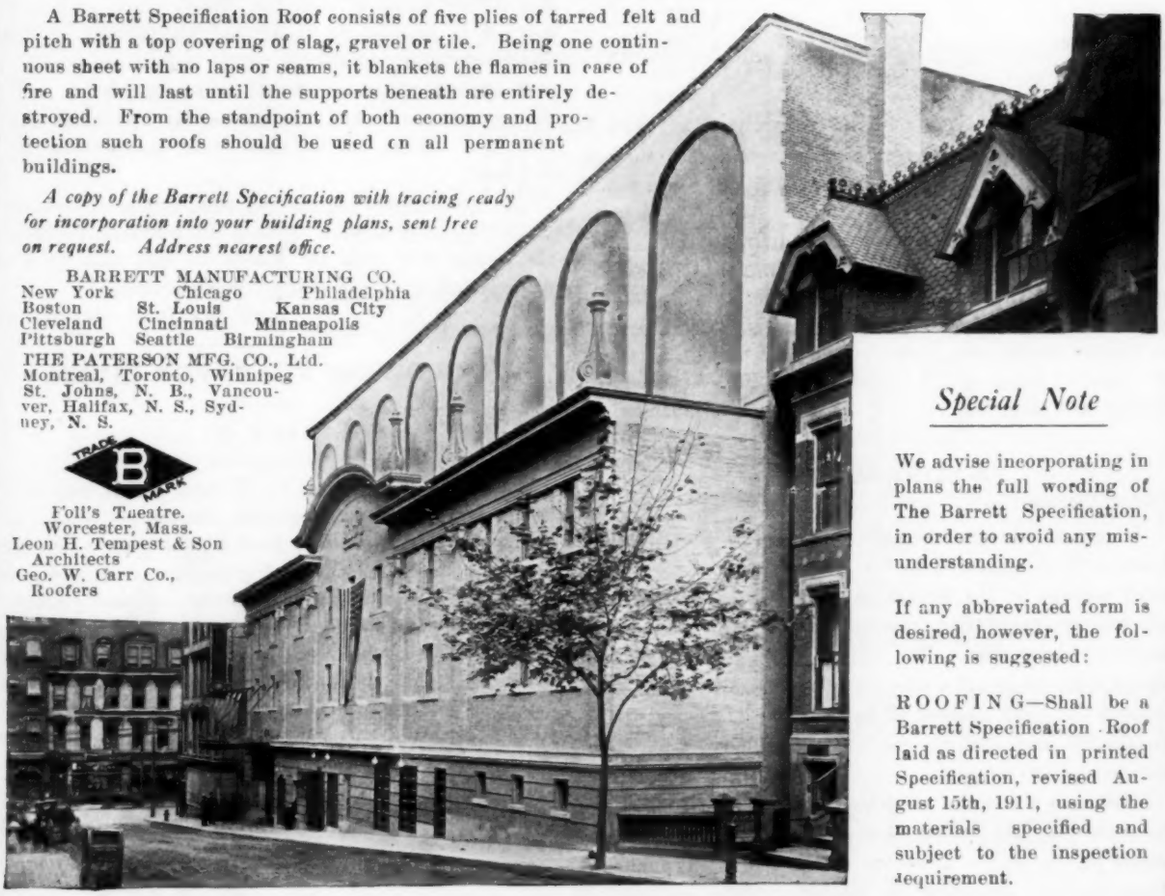

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distance from bite to bite between two pairs of rolls is governed by the length of the staple, the bulk of the stock, the amount of the draft, and amount of the twist and the kind or character of the cotton, whether wiry or harsh, or smooth and silky. The rolls must be spaced so that the feed roll releases the cotton before it is operated on by the next pair of rolls. If this is not done the fibers will be strained and broken. Rapidly revolving rolls must be set wider than those with slower speed, but do not get the idea that since the front pair of rolls on a fine fly frame revolves faster than the back pair that the front pair should be set the widest. As other things must be considered.

When the stock is started in the drawing frames it is of a large bulk and hard to draw and by setting the rollers a good distance apart, the fibers are easily drawn out from the others without being strained or broken. This statement holds good to a certain extent throughout the drawing process. As the stock passes from the third pair of rolls to the second it is lighter owing to the reduction that took place between the fourth and third pair of rolls. And for this reason the third and second pair of rolls can be set closer together without injury to the stock and so on clear through to and including the ring frame. Therefore the distance from the bite to bite or the distance between each pair of rollers in a set of drawing rollers either on drawing, fly frames or ring frames, increase from the delivery roll to the feed roll.

	1st to 2nd.	2nd to 3rd.
Slubbers	1 5/8	1 7/8
Intermediates	1 5/8	1 7/8
Fine frames	1 3/8	1 11/16
Ring frames	1 5/16	1 7/16

The table gives a correct setting from the slubber through, and I am sure that this setting will give results, as I have run them myself.

I do not exactly understand the fourth question. Does he want a remedy for these evils? In speaking of the bunches in the yarn, does he mean that his filling is bunching in the cloth or does he mean that it is bunches of cotton twisted to the yarn, better known as "gonts?" Just ask this question again and I am sure some of the readers of COTTON will help you. Student (Alabama).

A CORRECTION.

EDITOR COTTON:

In my article on "Average Numbers in the Spinning Room," which appeared in the August issue of COTTON, a small mistake in the figures in some way was allowed to slip into the calculation, making a slight error in the final average counts spun. The figures gave 44,520 hanks of No. 12's yarn when it should have been 56,420 hanks. This changes the total number of hanks from 303,395 as given, to 315,295 and changes the average number from 13.07 counts to 13.59 counts.

This was a mistake for which I am to blame, the error in some way not being detected until my attention was called to the matter after the article had been published. However, the principal of the calculation remains the same, and was what I was particularly anxious to bring out. B. M. P. (North Carolina).

COST ACCOUNTING.

EDITOR COTTON:

The subject of accurate cost accounting in the manufacture of all classes of cotton goods is a problem confronting the industry and which most manufacturers have not yet solved to their entire satisfaction. Diversified conditions almost preclude the possibility of formulating a system which can be used in all mills.

The writer is more familiar with existing conditions in the hosiery branch of the cotton industry. The National Association of Hosiery & Underwear Manufacturers have given much time and serious thought to the question, as yet no system has been evolved which can be used by every manufacturer as a basis on which to compute the cost of his product. The item of overhead expense naturally varies with the volume of production; the mill producing 2,000 dozen per day economically managed possesses an advantage over the mill turning out 1,000 dozen per day; there is also a wide divergence of opinion as to what expenditures are properly chargeable to overhead expense. Here is where the technically trained expert would prove of value to the practical mill owner.

An owner of a small mill could not understand why he did not make money; he was broad minded enough to go to a large competitor with his cost figures, it was very quickly demonstrated to him that his overhead expense did not include items which should have been charged against that account. A revision of his figures revealed the fact that he was selling goods at cost and during slack periods below cost; it is needless to state that his method of figuring underwent a radical change. This lack of knowledge operates against the man who is selling goods at cost, also the manufacturer who has arrived at approximately correct cost figures, as he must meet competition or lose business.

A "get together" spirit and comparison of methods will go a long way toward solving an intricate problem and the sooner it is done the sooner we will come to a better understanding of the cost of manufacturing.

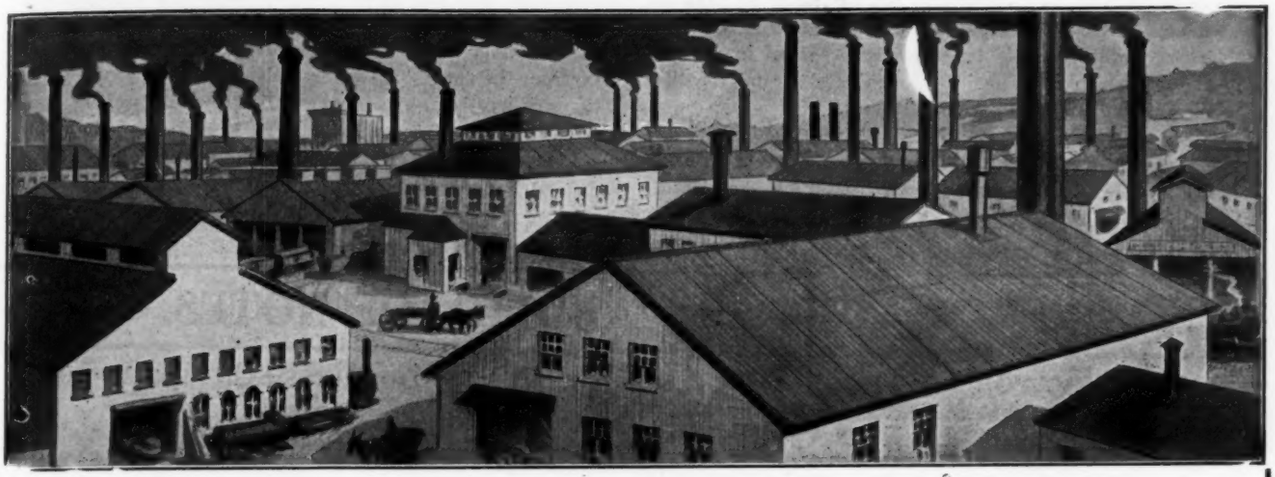
E. Mc. D. B. (Maryland.)

GROWING FLAX FOR LINEN.

BY J. M.

This is a new subject for COTTON and it may be of interest to some of your readers. In the cultivation of flax for linen the soil must be good a light loam which requires to be ploughed up in fall and exposed to frost and snow. In the early spring it must be broken up and cleared from weeds so that in sowing the seed and after it has taken root, there may be as few seeds as possible. Plant the flax seed when frost has disappeared about the same as oats and when it has attained about 3 inches in height, any weeds that have taken root should be pulled out, so that there will be less obstruction to the growth of the flax.

When ripe, the stem has attained about 36 inches, bearing a pod which contains the seed and the plant strips off its leaves and turns a light yellow. Then it is pulled from the roots by hand and placed in bundles or sheaves, bound around the center by a strap made from the flax or any other substitute. It is then put into water called dams with the roots down and weighted so it cannot get above the water,



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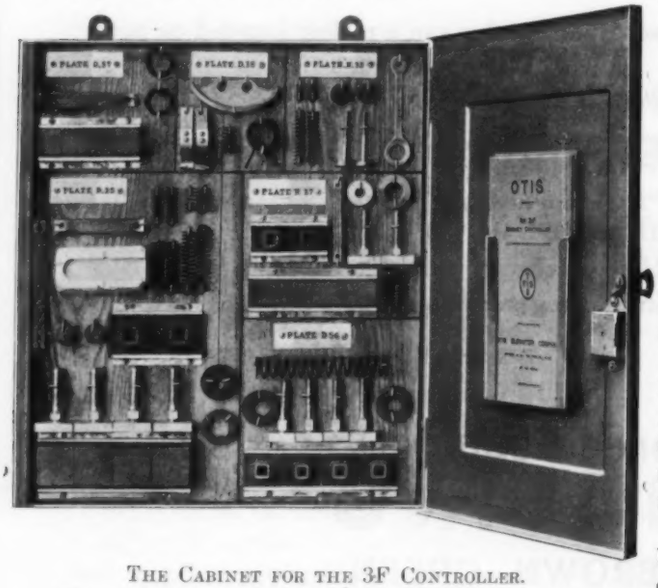
where it remains long enough to rot the stems so that the stem will break away from the fiber. When it has been thoroughly watered it is taken out and spread in rows to dry, after which it is again gathered and bound together in sheaves and taken to the mill for scutching.

This process consists of running it through wooden rollers grooved and fitting similar to the teeth of a driving wheel, or gear, which crushes the stem and makes the process of scutching more easy. The scutching is done by a revolving shaft attached to which are sets of blades resembling an air fan. The flax is held in the hand on a wooden rest, where the blades are revolving, and the scutcher, by occasional turning, separates the fiber from the stems, the pure flax from the tow. The latter makes a coarse grade yarn. The pure flax is put in bundles of 14-pound "stones," and the flax is ready for the buyer, who is sent from the spinner and grades the flax according to quality. It is then taken to the mill, where after going through various processes of refining, it is spun into yarn wraps and wefts and made into linen.

NEW MACHINERY AND TRADE NOTES.

OTIS ELEVATOR CONTROLLER PARTS CABINETS.

In order to facilitate and quicken repair service in the event of unexpected breakdowns, or worn parts on elevator controllers, there has been designed for the convenience of engineers and all who are responsible for elevator maintenance, a useful device known as the controller parts cabinet. This is a compact, strongly made steel box and contains the essential parts of the type of controller furnished with the elevator machine installed. By hanging it in the engine room, the engineer may, at an instant's notice, replace a worn part of the controller, and by referring to the catalogue on the inside of the cabinet cover, order immediately a new part to replace the part removed, keeping the cabinet complete for repair work, at all times.



THE CABINET FOR THE 3F CONTROLLER.

The advantages of having one of these cabinets in the engine room are obvious. Repairs can be made immediately, elevator service will not be impaired, and there is always at hand a remedy for any controller trouble. At present, these cabinets are being manufactured for direct current controllers only, and are furnished for the following familiar types of controllers used with Otis standard drum and traction machines of all voltages—HKS, 3F, 3FA, 3FD, 6F, 6FC, 6FD, MF2, MF4, and MF4B. It is stated that the price charged for these cabinets is nominal. They are manufactured by the Otis Elevator Company, Eleventh Avenue and Twenty-sixth street, New York City.

THE TRADE PRESS CONVENTION.

William H. Ukers, chairman of the Committee on Arrangements for the eighth annual convention of the Federation of Trade Press Associations to be held at the Hotel Astor, September 18 to 20, has announced the complete program for the three days sessions.

The opening session, Thursday morning, September 18th at 9:30, will be a keynote meeting, having for its subject: "Business Promotion Through Trade Press Efficiency."

After the address of welcome by President H. M. Wilson, of New York Trade Press Association, the response and annual address by President H. M. Swetland and the annual report of the Secretary-Treasurer, E. C. Johnston, there will be a series of ten minute outlook addresses by the presidents of the various local associations. After this, R. R. Shuman, of Chicago, will deliver an address on the subject, "The New Force in Business," to be followed by Elton J. Buckley, who will speak on "The Weakest Spot in Trade Press Efficiency." Between the morning and afternoon sessions, a lunch will be served at the Thirty-Ninth Street Publishers' Building, followed by an inspection of the plant and publishing offices of the Federal Printing Company.

The editorial symposium, under the leadership of A. I. Findley, of *Iron Age*, will be held at 2 o'clock, Thursday afternoon, September 18th. At this symposium will be presented papers on general editorial subjects; also on the relations of editors with other departments.

The Circulation Symposium, under the leadership of M. C. Robbins, will be held at 3:45 Thursday afternoon. At this symposium papers will be presented from subscription managers, canvassers and subscribers—those who read the trade press—giving their views as to its value to them, and wherein it fails to be of value to them.

Friday, September 19th, will be known as "Big Friday," because it contains three big meetings and the annual banquet on Friday evening. At the advertising symposium, which begins the day's sessions the keynote is: "Whenever an industry is served by a thoroughly competent business paper, its advertising pages offer the most economical advertising that this industry can purchase." At this meeting, which is under the leadership of Hugh M. Wilson, papers will be presented by educators, publishers, advertisers, advertising managers and advertising agents.

The big business meeting will bring together in one symposium, the biggest men in the trade paper publishing business in America. Here are to be told the inside stories of some of the big trade paper publishing successes. The speakers will state the fundamental principles upon which

each business was builded, H. M. Swetland, president, presiding.

The big north ballroom at the Hotel Astor, is to be given over to the mass meeting scheduled for Friday afternoon, which is expected to be the most largely attended meeting of the convention. There will be a number of inspirational addresses by representative business and professional men on subjects of live interest to editors, publishers and advertisers. At the annual banquet in the north ballroom of the Hotel Astor at 7 o'clock on Friday evening, John Clyde Oswald of the *American Printer,* will act as toastmaster. Some of the after dinner speakers who have been invited and who have signified their willingness to accept are: The Hon. Albert S. Burleson, postmaster general; the Hon. Wm. C. Redfield, secretary of the department of commerce; John Kendrick Bangs, Tom Daly, the Hon. Chas. F. Moore and Dr. N. M. Waters.

One of the most interesting sessions of the convention will be the publishers symposium scheduled for Saturday morning, September 20th, at 9:30. Here will be discussed aggressive policies, standards, and the ideals of the trade paper publishing business. All the regular sessions of the convention are open. Whosoever will may come, but tickets must be secured for the inspirational mass meeting. These may be obtained on application to any member of the federation or to the committee on arrangements. Seats at the annual banquet are $5.00 each. Application should be made to M. C. Robbins, chairman of the banquet committee, 239 West 39th street, New York. For further information address William H. Ukers, chairman of the committee on arrangements, 79 Wall street, New York.

THE RICHARDS-HINDS ROLL.

The strength of yarn depends upon two principal factors: the kind of cotton, and the arrangement of the fibers amongst themselves. The strongest fibered cotton does not make the strongest yarn; first, because it is shorter and, therefore, not capable of being bound into as strong a yarn as the longer but weaker fibers; and, second, because its greater diameter does not allow of as many fibers in the cross section of the yarn as is the case when finer fibers are used.

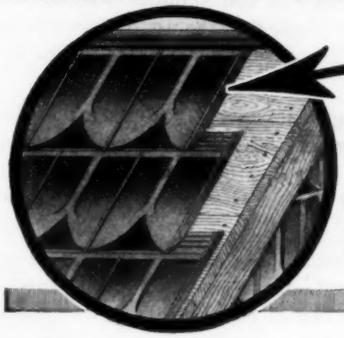
It is a well-known fact that the closer the rolls can be set in spinning the evener the yarn. This closeness of setting, however, has always been dependent on the length of staple being used and is today with the ordinary roll. In ring spinning, for instance, one might set 1/16 of an inch inside of staple; any closer setting would result in cockled yarn due to imperfect drawing.

The Richards-Hinds roll permits of a setting well within the length of fiber being drawn and without any danger whatever of cockling the yarn, giving increased strength and better spinning due to the fact that more of the short fibers are twisted in than would be the case with a wider setting. In making the claim that these rolls prevent cockley yarn, the makers say the claim is not born of imagination with the hope that it will prove true, but is based on actual facts, the result of nearly two years experiment with several thousand spindles equipped with this roll running on cotton 1 5/8 inch staple, this cotton being run with a setting of 1 inch from center to center on lever weighted frames.

It has been demonstrated by tests that yarns turned out under these rolls have an increased strength over yarns made on the ordinary roll, due to the fact that with the closer setting the shorter fibers are kept in line and are twisted in with the long fibers to a greater extent than could possibly be the case with a wider setting.

Previous to the introduction of this roll in a mill running fine carded yarns from 1 1/4 inch Egyptian cotton, considerable trouble was had in spinning 60's and 70's, and at that time no one spinner was given more than one frame of these fine numbers. Since the introduction of these rolls the mill is running their 70's carded from 1 1/4 inch Egyptian stock with a setting of 1 1/16, or as close as they can get on account of the diameter of their rolls (1 1/16 front, and 15/16 middle roll) and the work on these fine numbers is now running so well that instead of scattering these numbers throughout the room so that no one spinner will have

Instead Of Wood Shingles Or Slate



Cortright Metal Shingles

Instead of roof-fires or leaks—**Cortright Metal Shingles!** Safety is a big element in the value of any building and **safety** begins with the roof. Safety from fire, lightning and weather is secured with

CORTRIGHT
Metal Shingles
The Permanent Roofing

You put on a Cortright roof, paint it and then—forget it. You know it is going to give you protection from fire and weather and you know it will "last as long as the building and never need repairs."

Made in four styles, they are adaptable to your own residence or your operatives' cottages.

Interesting book, "Concerning That Roof," sent to all who request it.

Cortright Metal Roofing Co.

Philadelphia **Chicago**

The "1912" Cloth Cutting, Folding and Winding Machine

This machine will cut down operating expenses. It does in one operation the work which is now being done in two. It cuts the cloth, folds the edges and rolls them up in one operation, and at all times gets one more strip out of a bolt of cloth than is possible with the old method of cutting. At the same time it measures the bolt of cloth to show the manufacturer whether or not he is getting the number of yards he is paying for. With the high price of cotton to-day every knit goods manufacturer ought to look into this to see if he is getting the maximum efficiency at the least expense. You will find when you come to figure it up in the course of a year that the labor it saves is a b'g item.

Also have other labor-saving devices, and upon application you can get prices and full information on same.

J. A. FIRSCHING, 50 John St., Utica, N.Y., U.S.A.

more than one frame as was formerly done, these spinners are today running as many as 900 spindles each on 70's carded, proving beyond a doubt that the use of this roll has most decidedly brought about what the makers claim, *viz.*, better spinning.

With better spinning there must of necessity be less waste made. In mills where these rolls have been applied the amount of waste in spinning has been reduced due to the fact that on account of the better spinning fewer ends come down.

It has been demonstrated that with this roll a larger product can be turned off, due to the fact that a greater lineal speed per minute can be maintained.

In mills where these rolls have been introduced to any considerable extent, on account of the better running of the work the spinners are enabled to run more spindles than was done in these same mills previous to the introduction of this roll.

In changing from one staple to another it will seldom be found necessary to change settings when running these rolls, thus saving considerable time.

These rolls not being covered it can be seen that where three lines of leather covered rolls are now being run there will be a saving of one-third in the first cost of roll covering. On a short boss roll, two spindles to a roll, this will mean a yearly saving of considerable moment. For further information write to THE METALLIC DRAWING ROLL CO., Indian Orchard, Mass., and mention COTTON.

BOOK REVIEWS

All Books Reviewed Under This Heading May Be Procured From COTTON at the Published Price.

THE COTTON WEAVER'S HANDBOOK. By Henry Brougham Heylin, of the Royal Technical Institute, England. 326 pages. 358 illustrations. Price $2.50 net. Published by the J. B. Lippincott Co., Philadelphia, Pa.

The object which the author had in view in the preparation of this work was first in the interest of technical education; and second to place before the reader and student by simple methods of description and in as compact a handbook as possible, the principal conditions under which cotton goods are constructed and produced. No attempt has been made to exhaust the subject of fabric structure and design and gauze, leno and Jacquard weaving have only been lightly touched upon. The book is intended to be of great help to practical department heads, overseers, weavers, designers, etc., who feel the need of assistance along the line of their trade. The different branches of work in the book are divided under the general head of weaving, designing, the power loom and its accessories, analyzing the cloth, cloth quoting or costing, yarns for manufacturing purposes, the selection of warp yarns and yarn testing, reed and heald counting and calculations, important labor units in a weaving mill, and a miscellaneous chapter on a variety of subjects. One unique feature of this book is the binding in of blank pages interspersed with thick heavy paper blue pages for notes on yarn textures, sketching, costing, weave structures, power loom mechanism and quantities, and also ruled paper for weaving plans. This arrangement will allow the practical mill man to keep his own notes in connection with a valuable book of reference at all times. It will doubtless be well received by those of COTTON'S readers who are interested in the weaving end of the business.

CONSTRUCTION AND MANAGEMENT OF A COTTON MILL. 766 pages. Numerous illustrations. Price $3.00, postpaid. Published by Frank P. Bennett & Co., Inc., Boston, Mass.

This volume is a compilation of articles which have appeared from time to time in the American Wool and Cotton Reporter. For convenience, these articles have been divided into four headings as follows: Mill Construction and Power; Cotton Mill Management; Bleaching, Dyeing and Finishing; and Cotton Mill Cost Finding. 463 pages are devoted to the second department on Cotton Mill Management and it contains a large amount of interesting material. It has the ear marks of the same author in all or nearly all its text and indicates a thorough knowledge of the little things around a cotton mill that count so much in the successful operation of such a mill. It will be read with interest by a great many men connected with the manufacture of textiles, but it would have made a much stronger work if the various departments had been suitably divided into chapters telling a more continuous story of the subject under discussion, and eliminating a large quantity of the subheads, which serve no real purpose and tend to detract from the otherwise neat appearance as well as divert the readers' attention as he goes over the printed page. It would doubtless have attracted more widespread attention if the names of the authors of the various articles utilized had been included and they had been given credit for the preparation of such articles. This would have increased the individuality of the book as a whole.

THE USUAL RESULT.

When the I. W. W. leaders incite a strike and adopt the association's usual methods of sabotage and violence, the result can be forecasted by a study of almost any of their recent attempts. Take the case of the DRAPER COMPANY: On March 31st the men in their manufacturing department numbered 2077; on April 3d, 1253; and on July 31st, 2103. As the men went out on the strike April 1st, the March 31st figures show the number of men required at that time to produce the average output as it had been running for several months previous. The April 3d figures give the number of men on the date that the demands of the I. W. W. formulated. The July 31st figures show that the vacancies have all been filled and that they had 26 more men than before the trouble began.

It will take some time to get all departments thoroughly regulated, but they report improvement every day, and the output is rapidly increasing. In a recent announcement in Cotton Chats they again thank their many friends, customers, stockholders, loyal employes, and the general public for the cooperation and sympathy extended to them at the time of the difficulty.

Headquarters for finishing compounds, sizings and starches of all kinds are the offices of THE ARABOL MFG. Co., 100 William St., New York. They keep constantly adding to their line and are prepared to meet any special need and local condition.

CLINCHFIELD COAL
CUTS DOWN THE COST

BOSTON TEXTILE WEEK.

The fourth national textile exhibition under the auspices of the Textile Exhibitors Association will be held at the Mechanics Building, Boston, from April 27 to May 2nd, 1914, inclusive. This textile exhibition will allow the cotton manufacturer to come face to face with the newest and best developments in machines and processes for improving mill conditions and mill products. The various associations of cotton manufacturers have been invited to hold their spring conventions in conjunction with this exhibition and a hall will be furnished for that purpose in the same building with the exhibition. This invitation will probably be largely accepted.

While this exhibition of textile machinery has been held on prior occasions, at no time since the organization of the Textile Exhibitors Association has anything been undertaken anywhere near the scale of the present exhibition. The entire Mechanics Building has been engaged for that week and with the 125,000 square feet of floor space available, the association is planning to give the largest and best display ever made of textile machinery and allied interests. The allotment of space and of other details of this magnificent exhibition will be under the general management of Chester I. Campbell, the popular secretary and treasurer of the Textile Exhibitors Association. All communications in relation to space or exhibits should be addressed to him at 5 Park Square, Boston.

The Mason Machine Works officially announce the removal of their Southern office to Greenville, S. C., on August 15, 1913. Edwin Howard, the popular Southern representative, will still be in charge of the offices in their new location. This change was described at some length in the July issue of COTTON.

The Cassella Color Co., 182 Front St., New York City, are sending to the trade color cards describing their diamine jet black, GG extra conc. and BB extra conc.; also immedial indone B. S. conc. Copies of these color cards may be secured on application.

MILL NEWS

Notices of mill projects, additions or lmprovements are solicited for this department

GEORGIA.

ATHENS. The machinery for the No. 2 mill of the Athens Mfg. Co. is being erected, and the mill is expected to be in operation by October 15.

CALHOUN. The Echota Mills are to double the capacity of their plant and have placed an oder for the additional 5,000 spindles with Rogers W. Davis, of the Saco-Lowell Shops.

LA GRANGE. Among the cotton mill improvements that have been recently made in this city are 30 houses for the Dixie Cotton Mills, costing $20.000; eight houses for the LaGrange Mills costing $6,500; 12 houses for the Elm City Mills, and Unity Cotton Mills costing $9.000; and an extension to the Dixie Cotton Mills costing $75,000.

INDIANA.

INDIANAPOLIS. The Indianapolis Bleaching Co., is planning to erect a five-story concrete cotton warehouse. When this new warehouse is completed, the present warehouse will be converted into a welfare house for the women workers of this company, which will be in charge o fa matron under the auspices of the Y. W. C. A. It will be furnished up in an attractive manner and will be opened evenings and Sundays as well as week days.

NEW YORK.

ALBANY. The Keystone Knitted Fabric Company, New York City, incorporated, with a capital of $25,000, by Jean Bey, John Fraser and Herman H. Haltermann.

MOHAWK. The Elastic Spring Knit Corporation incorporated to manufacture hosiery and underwear. Capital, $250,000. Incorporators: J. M. Sullivan, William F. Powell and Arthur W. Britton.

NORTH CAROLINA.

ALBEMARLE. Extensive improvements are being made to the plant of the Wiscasset Mills, including a 200-foot smokestack with an 8½-foot flue. This is to replace the smaller stack which has been torn down.

BLADENBORO. It is reported that the Bladenboro Cotton Mills have recently purchased a 25 Kva. Terry turbo-alternator.

CHARLOTTE. A new eight-room school building is being erected at the Chadwick-Hoskins Mill at this place. It is to cost $12,000 when completed.

GREENSBORO. The Proximity Mfg. Co., are soon to place in operation for an electric drive in its mill a 937 Kva Curtis turbo- generator, with the necessary motor generator sets, transformers and motors.

GIBSONVILLE. The Gibsonville Hosiery Mills, capital stock $100,000, incorporated by J. L. Kernodle, G. W. Fogleman, W. . Michael and others.

LEXINGTON. Theh Erlinger Cotton Mills are to install electrical apparatus, including an 1875 Kva. Curtis turbo-generator, with exciter, 1800 Kw. motor-generator set, transformers, switchboards, accessories, including 800 motors.

PENNSYLVANIA.

ROYERSFORD. The contract has been awarded by the Progressive Knitting Company for the erection of a new building to be four stories high, 138 x 50 feet.

RHODE ISLAND.

PROVIDENCE. The Roseknit Hosiery Company has been incorporated, capital $20,000, by Frank L. Rosenfeld, Gerald L. Rosenfeld and James Dunlop. Corporation succeeds company of same name.

SOUTH CAROLINA.

ANDERSON. The Riverside-Toxaway Mills are building a number of new operatives' houses at its village.

BATESVILLE. The Batesville Mfg. Co., are considering the installation of looms for either towels or duck, so it is reported locally.

CLINTON. One of the latest developments along welfare lines is being accomplished by C. M. Bailey, treasurer of the Lydia Cotton Mills, who has recently purchased 50 acres of land and is cutting it up into lots. Each operative may purchase one lot and pay for it by installments at the pro rata price that the original tract cost the mills. This will in time allow the operatives to own their own homes.

COLUMBIA. The Southern Aseptic Laboratories, of this place, suffered a loss of about $50,000 by a fire which destroyed two of the three main divisions of the plant on the night of August 13. The company is capitalized at $90,000, having recently increased its capital to that amount from $50,000. G. A. Guignard, of Columbia, is president and treasurer, and P. A. Shultz is general manager. This plant manufactures absorbent cotton for the surgical and kindred trades, and it is understood locally that the mill will be rebuilt shortly.

GREENVILLE. It is reported here that the Piedmont Mfg. Co., has let contract for the construction of an additional cloth room to the Gallivan Construction Co, of Greenville.

LANDO. The operatives' houses at the Manetta Mills are being thoroughly repainted.

PACOLET. The Pacolet Mfg. Co., has completed its installation of 6,592 spindles that we referred to some time ago.

REEDY RIVER. The Conestee Mills are to replace a large number of their looms with Draper looms. It is also reported that they intend to build another warehouse.

ROCK HILL. The Wymojo Yarn Mills Co., is adding 3,000 spinning spindles to their equipment.

UNION. The Monarch oCtton Mills are to install an 1875 Kva. Curtis turbo-generator, with the usual accessories.

WARE SHOALS. The Ware Shoals Mfg. Co. has arranged to add to the electrical equipment in its mills a 937 Kva. Curtis turbo-alternator with accompanying machinery.

TENNESSEE.

MORRISTOWN. It is understood that the Holston Mfg. Co., of Lenoir City, Tenn., is considering the establishment of a branch plant to be located here. T. A. Weiss is the president.

TEXAS.

GONZALES. It is reported that the Gonzales Cotton Mills are to enlarge their spinning equipment, by the addition of 3,000 spindles.

ROLLER, CLEARER AND SLASHER CLOTHS

To be sure of getting mill cloths of uniform quality exactly filling your requirements, order the products of the

American Felt Company

TRADE MARK

This trade-mark, on every yard of our Roller, Slasher and Clearer Cloths, means best quality, best service and best prices. It is the guarantee of the oldest and largest manufacturer in America of Felts for all purposes.

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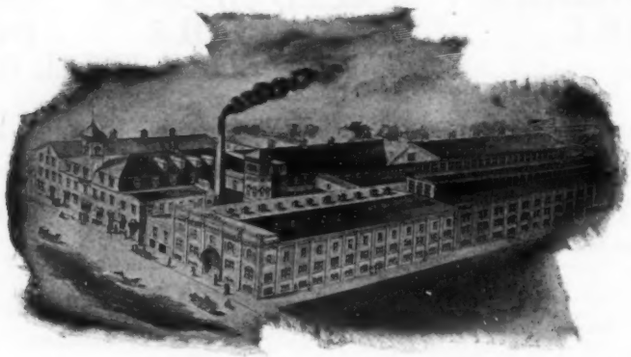

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The rate for "Positions Wanted" and "Help Wanted" advertisements of 40 words or less is one dollar an insertion; additional words two cents each, payable in advance. Remittances and copy should reach this office not later than the twenty-fifth of the month.

Replies may be sent in care of COTTON, Atlanta, Ga.

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216 No. Front Street, Philadelphia, Pa.

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50 Standard B Machines for sizes.
9 " " " 120 needles 3¾ in.
24 Mayo Acme " for line of sizes.
100 Ribbers and Sleevers, various makes.
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100 Ribbed Underwear Machines, various makes.
2 Extractors.
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1 Allen 40 Spindle Cop Winder.
4 Hosiery Winders.
60 Union Special Sewing Machines.
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POSITION WANTED—As agent or superintendent by northern man. Well up on yarn and absorbent cotton. Write Box No. 2, care Cotton, Atlanta, Ga. C-9-1t

POSITION WANTED—By designer expert on all Jacquards fabrics, fancy cotton quilts, table covers, blankets, Jacquard Dobby and box looms. Ten years with the Arlington Mills, Lawrence, Mass. Best of references. Steady and efficient. Address Alexander Marshall, 114 Oakdale Ave., Pawtucket, R. I. P-9-1t

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COTTON FABRICS DUCKS, OSNABURGS, SHEETINGS, DRILLS, ETC.
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The William H. Lorimer's Sons Company
Manufacturers of
Mercerized Cotton Yarns for All Purposes
MERCERIZERS AND DYERS
Office and Works, Ontario and Lawrence Sts., PHILA., PA.

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Cotton Yarns direct from mill to mill. Singles—two, three and four plies for weaving and knitting.
Skein—Warp—Cops—Cones—Tubes, Carded and Combed.

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100 illustrations

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It is based on a broad experience in lighting installations under a wide variety of conditions and treats the various problems from the standpoint of individual installations. Actual results are given precedence over generalized statements. It covers a wide range of problems in lighting for various classes of work, with the solutions that have been obtained by the author in practice.

It is of practical value not only to Works Managers and Illuminating Engineers, but to Central Station Salesmen who want practical information on good and bad lighting in shops, drafting-rooms, offices, power houses, etc.

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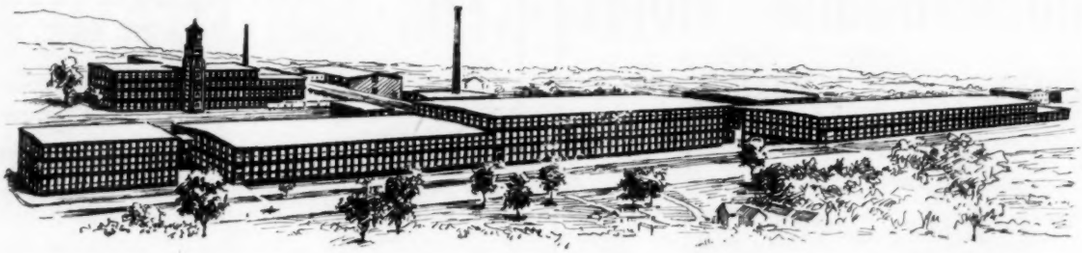

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(The Humidifier with the Guarantee)

A Turbo user wrote this advertisement. Anything that we could add would be superfluous. Read this evidence as to efficiency of service and low cost of up-keep.

37 cents per head per year

"We have just laid out a routine for the care of the Humidifiers and have put a section of the work through and obtained our costs from this as follows:

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General cleaning of all heads in system every six months	8.00
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Nothing to equal this in New England

Rooms with private baths for $1.50 per day and up; suites of two rooms and bath for $4.00 per day and up. Dining room and Cafe first class. European plan.

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Stone floors; nothing wood but the doors.
Equipped with its own sanitary vacuum cleaning plant.

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Your Iron, Coal, Coke, Timber and other raw materials are procurable at the lowest cost and in any quantities you need them, from immense supplies under your hand on every side. Efficient labor is plentiful, and water power abundant and inexpensive.

The prosperous, loyal community round about supplies a home market of great possibilities. Excellent shipping facilities open the whole country for promotion of sales on a successful competitive basis.

The progress that this district has made along industrial, commercial and agricultural lines during the past few years is but an indication of the prosperity that will mark its future. In it is the rational location for your factory. Any information you desire will be sent gladly and promptly upon request.

Address J. M. MALLORY, Savannah, Ga., Industrial Agt.
CENTRAL OF GEORGIA RAILWAY COMPANY

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For Sale at a Sacrifice

A substantially constructed and well equipped Hosiery Mill in an aggressive Alabama city of 6,000 population, having a capacity of 550 dozen pairs of hose daily, is now offered for sale at a sacrifice price, due to inexperienced management and lack of sufficient working capital.

The property comprises 2½ acres of ground, several tenant houses, well constructed office, warehouse and factory buildings, equipped with 100 Mayo knitting machines, all necessary ribbers, loopers and sewing machines; 60 h. p. boiler and electric motor furnish sufficient power.

The plant is located on the main line of the

SOUTHERN RAILWAY

which affords excellent transportation facilities to all the large distributing centers.

The many orders now on hand, and the fact that future deliveries cannot be promised, show the good markets now existing for the factory's output.

This is an opportunity one will seldom find—a well established business, all equipment in first-class order, good location, big markets and a very low figure buys it all.

Refer to file No. 2495, and write for full particulars.

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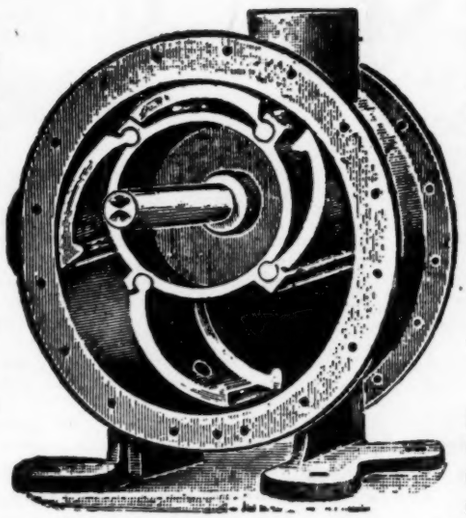
They take up their own wear by the action of centrifugal force.

No delicate parts to break or get out of order.



In selecting a blower or vacuum pump the machine must be one that will give a *strong, positive* pressure or suction. This result can only be obtained by the use of a *positive* blower or vacuum pump such s we manufacture. The machine must have a powerful pressure or suction after long continued operation, as well as when new. No power must be wasted in overcoming unnecessary friction.

Simple in Construction.

The construction of our pump is so simple that any one can easily understand it at a glance. The small size of piston used allows a very large space for air, resulting in a large volume, which means that a smaller size pump of our make may be used for a given purpose than would be the case with any other make. This, of course, means a lower first cost.

Many uses for these machines in business or the home.

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Forging
Oil Appliances
Gas Appliances
Coal Appliances
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Blowing dust and dirt out of motors and machines.
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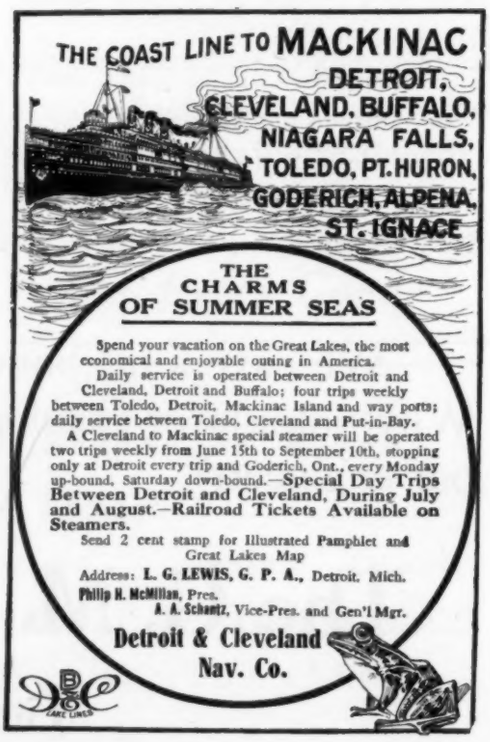
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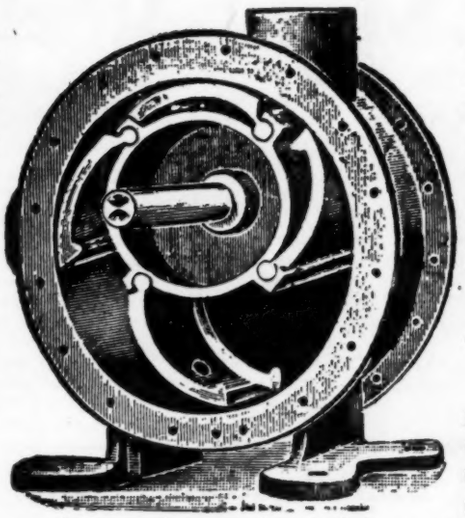

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Gas Appliances
Coal Appliances
Wireless telegraphy
Massaging
Assaying
Blowing dust and dirt out of motors and machines.
Gas lighting
Pressing irons
Atomizing and spraying
Removing foul air from rooms
Printing presses
Melting
Supplying fresh air to rooms
Cash carrier systems
Testing gas fixtures
Sand blasting
Piano players
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Mailing machines
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Milking machines
Ice plants
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E. Schmidt, 1850 North Ave.
Willis C. Squire & Co.
Schwartchild & Co.
Cincinnati—Thoma Bros. Co.
E. & J. Swigart Co.
E. A. Kinsey Co.
Wm. T. Johnston Co.
Cleveland—Strong, Carlisle & Hammond.
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Russia—White, Child & Beney, Moscow.
Victoria, Australia—Eckersley & Sons, Melbourne.
Montreal, Canada—Canada Machy. Agency.
G. J. Lunn & Co.
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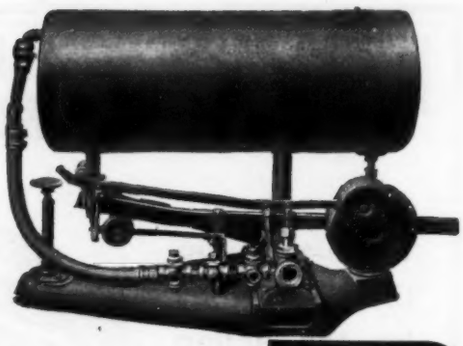
The Morehead Back to Boiler SYSTEM

Will Return That Water in Your Steam Lines to Your Boiler



IF the amount of your steam line condensation is of any volume at all don't waste it. Send for a "Trial Trap" and see how quickly the Morehead System will show savings in your coal bills, repair expenses, etc., not to mention the great improvement in your heating system.

From 20 to 40% of the heat units in the water of condensation is lost by cooling the condensation down to accommodate a steam pump.

Morehead Traps return the condensation with its full heat content direct to your boiler with practically no drop in temperature.

MOREHEAD TRAPS are being used everywhere on Heating, Drying, and Cooking propositions of every kind from straight pipe work to fan stacks and under vacuum conditions without regard to the difference in pressures between the apparatus drained and that carried on the boiler and without regard to the location of the apparatus drained, whether above or below the water line in the boiler.

There is a Morehead Trap for any kind of service. Just state your conditions and we will send you a Trap for free trial.

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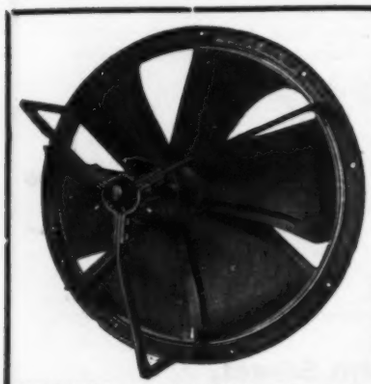

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Reward of Merit. Over 9,500 in use.

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THEIR USE MEANS A CONSIDERABLE SAVING

They reduce the weight on bearing, cost less to erect, the shaft stays in better alignment as they weigh from 50 to 75 per cent less than cast iron pulleys, 15 to 20 per cent better belt adhesion, less liable to fly to pieces when run at high speed and can be had in the larger sizes up to 120" diameter with 40" face.

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Flat "A" braced arms (edge on) give perfect rigidity and least air resistance.
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No need to strip the shaft. Fit two halves of pulley together, then tighten clamping bolts evenly.
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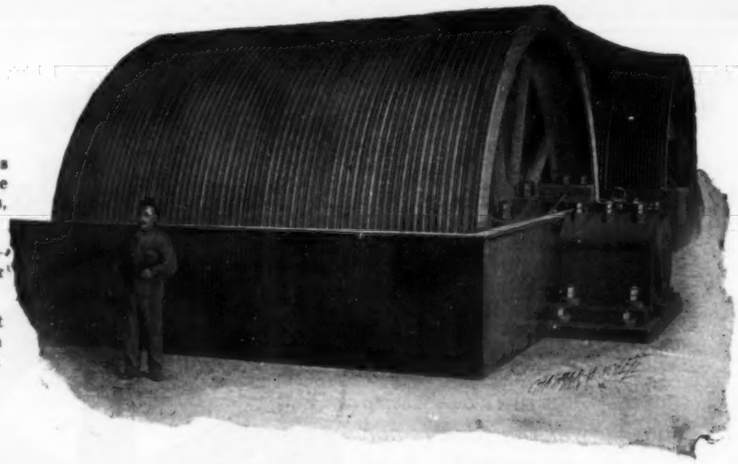

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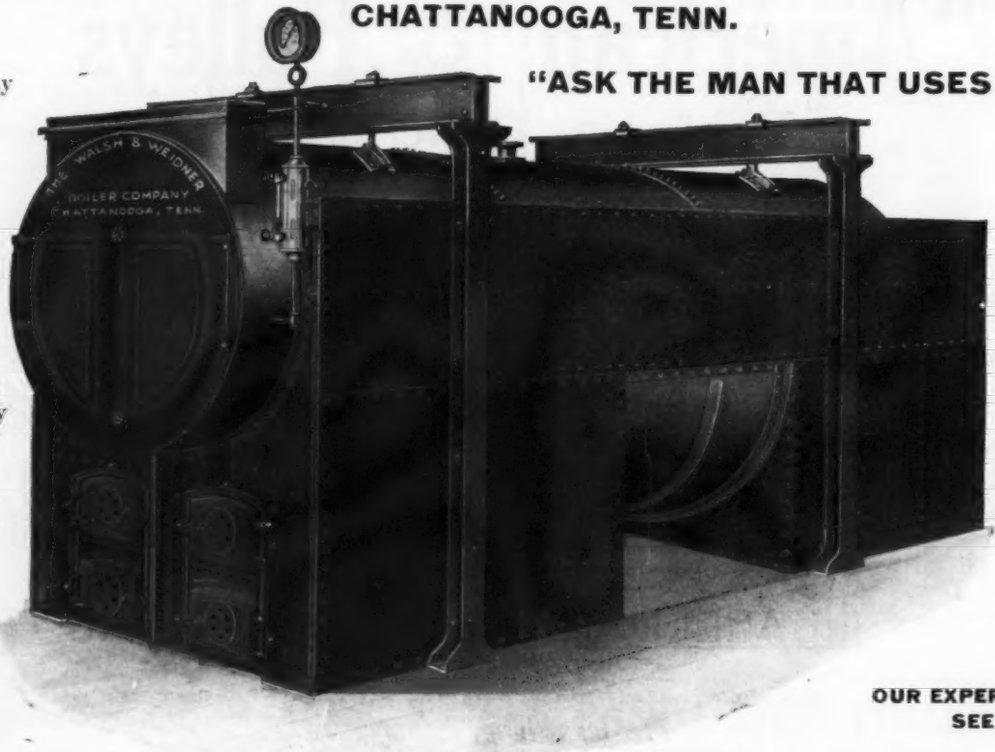

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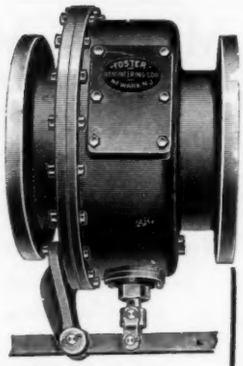

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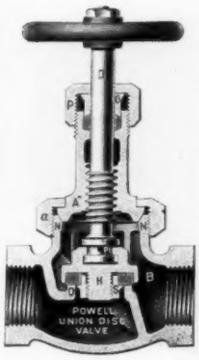

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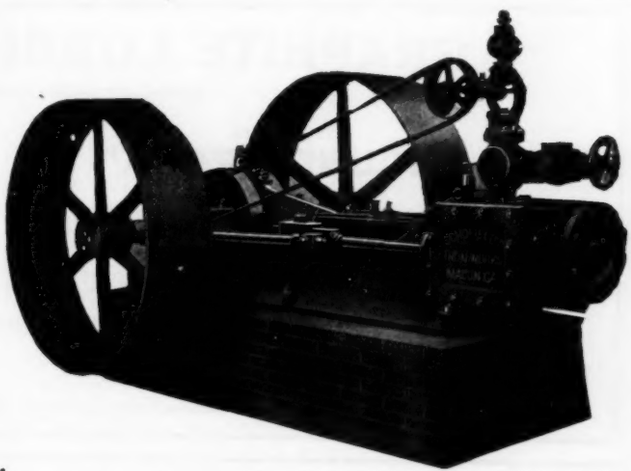

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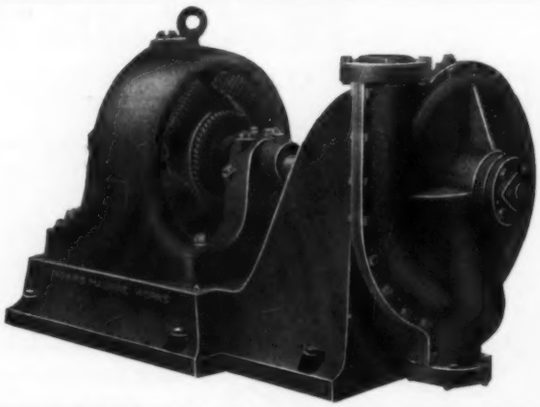

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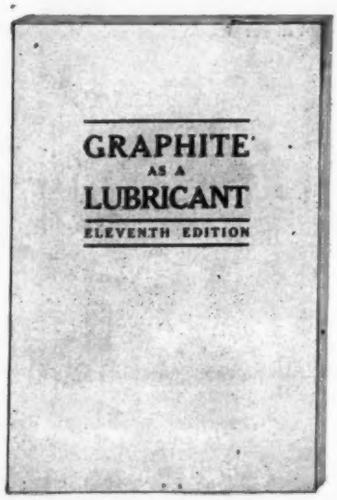
And these smooth, easy-running bearings lubricated with Dixon's Flake Graphite will cut down our friction load and give us more available power—and save us a lot of time and trouble and work.



THIS BOOK will tell you how to use graphite—what kinds of graphite to use—how to feed it to various kinds of bearings—how to make good graphite lubricators yourself. And it explains why Flake Graphite is the best lubricating graphite—in fact, the only **real** lubricating graphite. Write for your copy, and ask for a sample of Dixon's Flake Graphite, No. 94.

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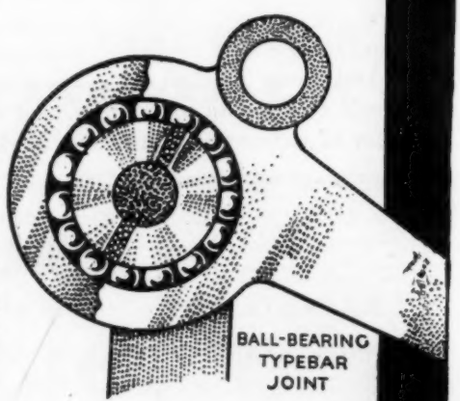

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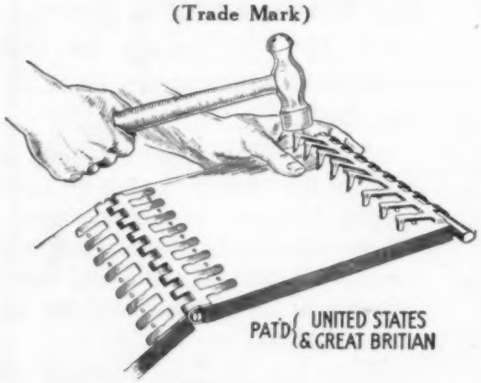

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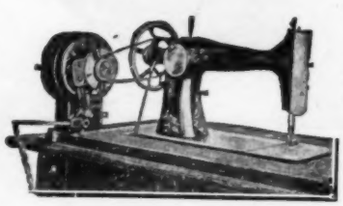

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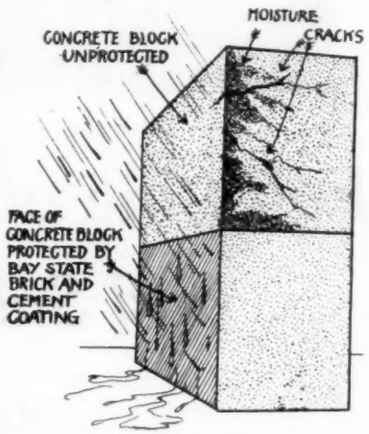

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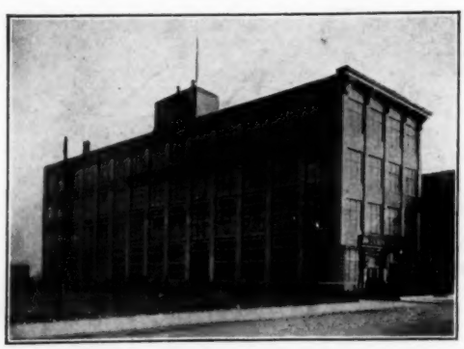

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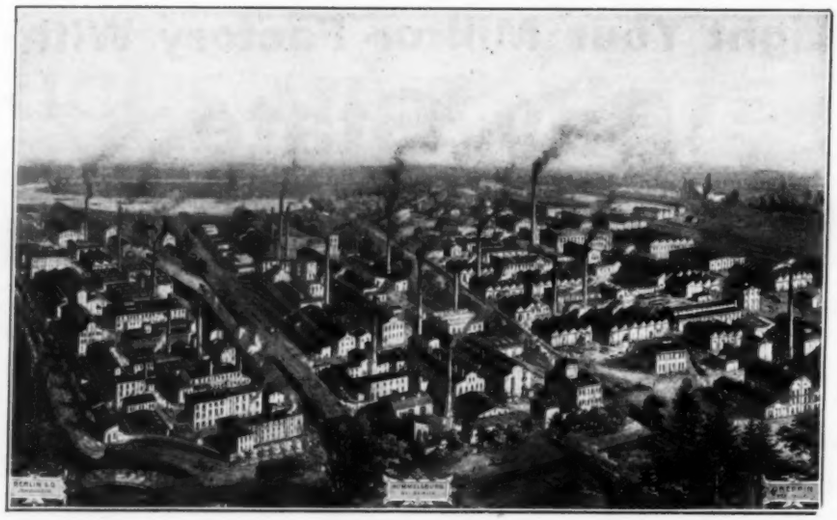

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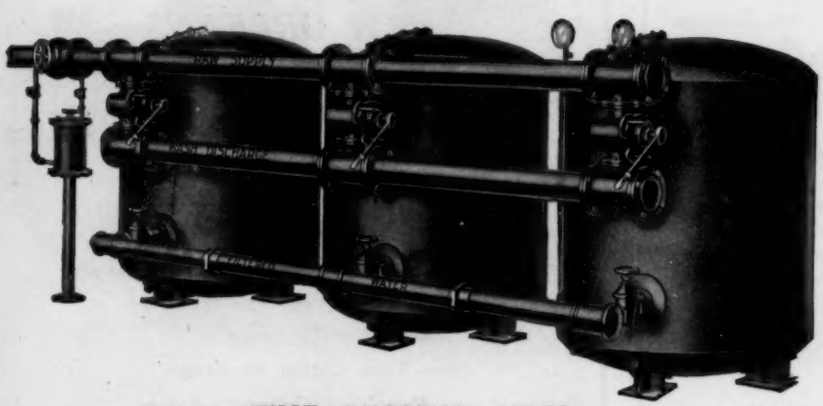

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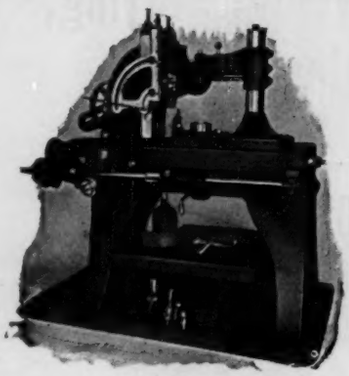

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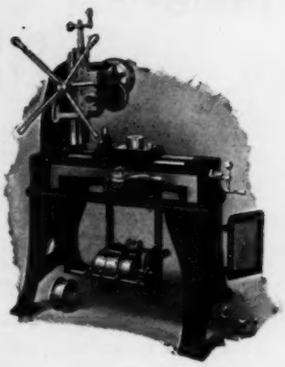

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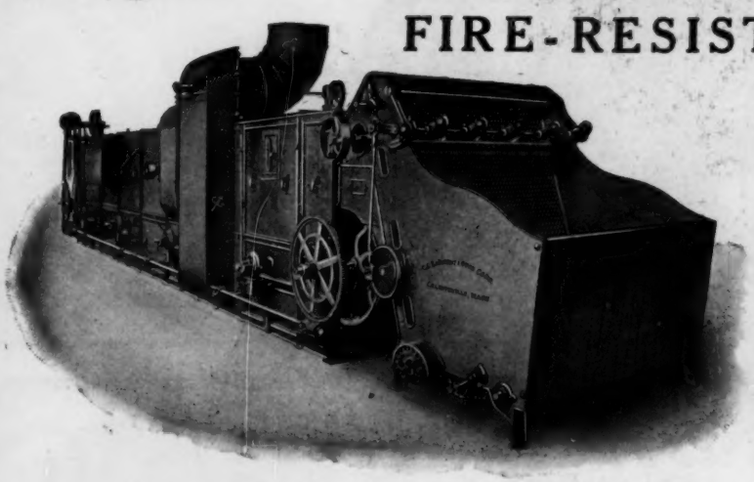

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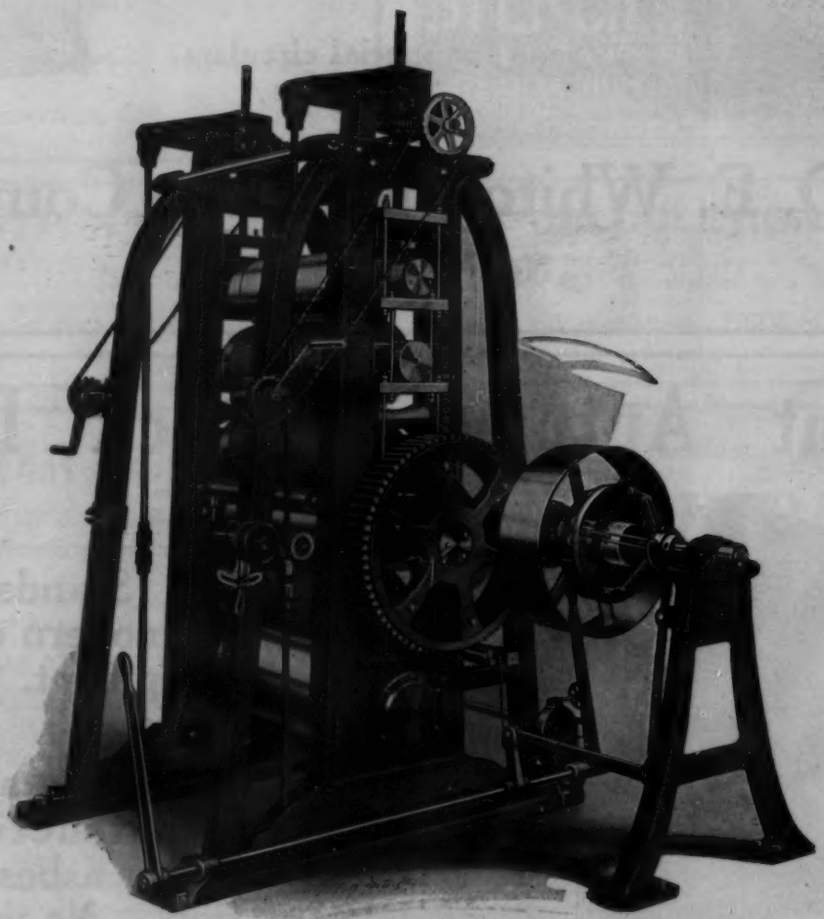

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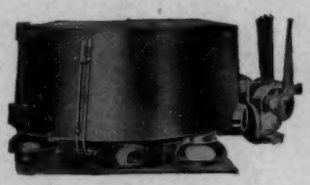

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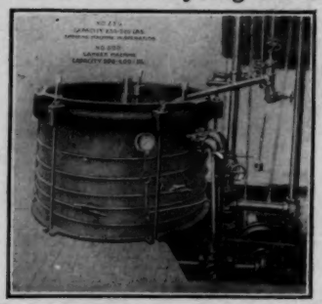

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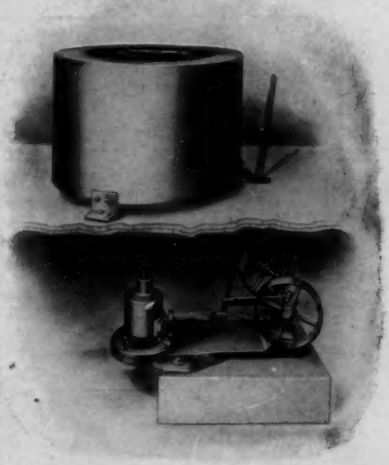

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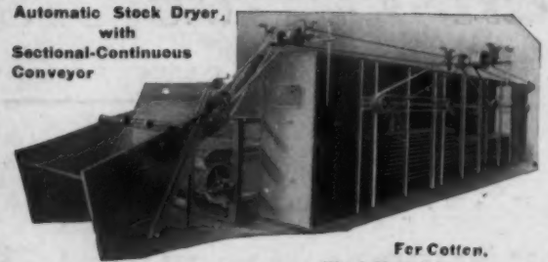

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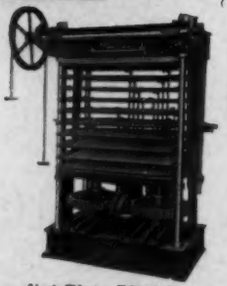

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